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The Web at 25 in the US

Digital Life in 2025

Experts predict the Internet will become 'like electricity' — less visible, yet more deeply embedded in people's lives for good and ill

**FOR FURTHER INFORMATION
ON THIS REPORT:**

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About This Report

This report is the latest research report in a sustained effort throughout 2014 by the Pew Research Center to mark the 25th anniversary of the creation of the World Wide Web by Sir Tim Berners-Lee. He wrote [a paper](#) on March 12, 1989 proposing an “information management” system that became the conceptual and architectural structure for the Web. He eventually released the code for his system — for free — to the world on Christmas Day in 1990. It became a milestone in easing the way for ordinary people to access documents and interact over the Internet — a system that linked computers and that had been around for years.

The Web became a major layer of the Internet. Indeed, for many, it became synonymous with the Internet, even though that is not technically the case. Its birthday offers an occasion to revisit the ways it has made the Internet a part of Americans’ social lives.

Our first [report](#) tied to the anniversary looked at the present and the past of the Internet, marking its strikingly fast adoption and assessing its impact on American users’ lives. This report is part of an effort by the Pew Research Center’s Internet Project in association with [Elon University’s Imagining the Internet Center](#) to look at the future of the Internet, the Web, and other digital activities. This is the first of eight reports based on a canvassing of hundreds of experts about the future of such things as privacy, cybersecurity, the “Internet of things,” and net neutrality. In this case we asked experts to make their own predictions about the state of digital life by the year 2025. We will also explore some of the economic change driven by the spectacular progress that made digital tools faster and cheaper. And we will report on whether Americans feel the explosion of digital information coursing through their lives has helped them be better informed and make better decisions.

This report is a collaborative effort based on the input and analysis of the following individuals.

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About the Imagining the Internet Center at Elon University

The Imagining the Internet Center's mission is to explore and provide insights into emerging network innovations, global development, dynamics, diffusion and governance. Its research holds a mirror to humanity's use of communications technologies, informs policy development, exposes potential futures and provides a historic record. It works to illuminate issues in order to serve the greater good, making its work public, free and open. The center is a network of Elon University faculty, students, staff, alumni, advisers, and friends working to identify, explore and engage with the challenges and opportunities of evolving communications forms and issues. They investigate the tangible and potential pros and cons of new-media channels through active research. The Imagining the Internet Center sponsors work that brings people together to share their visions for the future of communications and the future of the world.

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Overview — 15 Theses About the Digital Future

The world is moving rapidly towards ubiquitous connectivity that will further change how and where people associate, gather and share information, and consume media. A canvassing of 2,558 experts and technology builders about where we will stand by the year 2025 finds striking patterns in their predictions. The invited respondents were identified in [previous research](#) about the future of the Internet, from those identified by the Pew Research Center's Internet Project, and solicited through major technology-oriented listservs. They registered their answers online between November 25, 2013 and January 13, 2014.

In their responses, these experts foresee an ambient information environment where accessing the Internet will be effortless and most people will tap into it so easily it will flow through their lives "like electricity." They predict mobile, wearable, and embedded computing will be tied together in the Internet of Things, allowing people and their surroundings to tap into artificial intelligence-enhanced cloud-based information storage and sharing. As **Dan Lynch**, founder of Interop and former director of computing facilities at SRI International, wrote, "The most useful impact is the ability to connect people. From that, everything flows."

To a notable extent, the experts agree on the technology change that lies ahead, even as they disagree about its ramifications. Most believe there will be:

- A global, immersive, invisible, ambient networked computing environment built through the continued proliferation of smart sensors, cameras, software, databases, and massive data centers in a world-spanning information fabric known as the Internet of Things.
- "Augmented reality" enhancements to the real-world input that people perceive through the use of portable/wearable/implantable technologies.
- Disruption of business models established in the 20th century (most notably impacting finance, entertainment, publishers of all sorts, and education).
- Tagging, databasing, and intelligent analytical mapping of the physical and social realms.

These experts expect existing positive and negative trends to extend and expand in the next decade, revolutionizing most human interaction, especially affecting health, education, work, politics, economics, and entertainment. Most say they believe the results of that connectivity will be primarily positive. However, when asked to describe the good and bad aspects of the future they foresee, many of the experts can also clearly identify areas of concern, some of them extremely threatening. Heightened concerns over interpersonal ethics, surveillance, terror, and crime, may lead societies to question how best to establish security and trust while retaining civil liberties.

Overall, these expert predictions can be grouped into 15 identifiable theses about our digital future – eight of which we characterize as being hopeful, six as concerned, and another as a kind of neutral, sensible piece of advice that the choices that are made now will shape the future. Many involve similar views of the ways technology will change, but differ in their sense of the impact of those technical advances. They are listed below, numbered for the sake of convenience to readers navigating this document, not in a rank ordering.

More-hopeful theses

1) Information sharing over the Internet will be so effortlessly interwoven into daily life that it will become invisible, flowing like electricity, often through machine intermediaries.

David Clark, a senior research scientist at MIT's Computer Science and Artificial Intelligence Laboratory, noted, "Devices will more and more have their own patterns of communication, their own 'social networks,' which they use to share and aggregate information, and undertake automatic control and activation. More and more, humans will be in a world in which decisions are being made by an active set of cooperating devices. The Internet (and computer-mediated communication in general) will become more pervasive but less explicit and visible. It will, to some extent, blend into the background of all we do."

Joe Touch, director at the University of Southern California's Information Sciences Institute, predicted, "The Internet will shift from the place we find cat videos to a background capability that will be a seamless part of how we live our everyday lives. We won't think about 'going online' or 'looking on the Internet' for something — we'll just be online, and just look."

2) The spread of the Internet will enhance global connectivity that fosters more planetary relationships and less ignorance.

Bryan Alexander, senior fellow at the National Institute for Technology in Liberal Education, wrote, "It will be a world more integrated than ever before. We will see more planetary friendships, rivalries, romances, work teams, study groups, and collaborations."

Paul Jones, a professor at the University of North Carolina and founder of ibiblio.org, responded, "Television let us see the Global Village, but the Internet let us be actual Villagers."

Tim Bray, an active participant in the Internet Engineering Task Force (IETF) and technology industry veteran, noted, "I expect the miasma of myth and ignorance and conspiracy theory to recede to dark corners of the discourse of civilization, where nice people don't go. The change in the emotional landscape conferred by people being able to communicate very cheaply irrespective of geography is still only dimly understood."

3) The Internet of Things, artificial intelligence, and big data will make people more aware of their world and their own behavior.

Patrick Tucker, author of *The Naked Future: What Happens In a World That Anticipates Your Every Move?*, wrote, “When the cost of collecting information on virtually every interaction falls to zero, the insights that we gain from our activity, in the context of the activity of others, will fundamentally change the way we relate to one another, to institutions, and with the future itself. We will become far more knowledgeable about the consequences of our actions; we will edit our behavior more quickly and intelligently.”

Judith Donath, a fellow at Harvard University’s Berkman Center for Internet and Society, responded, “We’ll have a picture of how someone has spent their time, the depth of their commitment to their hobbies, causes, friends, and family. This will change how we think about people, how we establish trust, how we negotiate change, failure, and success.”

4) Augmented reality and wearable devices will be implemented to monitor and give quick feedback on daily life, especially tied to personal health.

Daren C. Brabham, a professor at the Annenberg School for Communication & Journalism, University of Southern California, predicted, “We will grow accustomed to seeing the world through multiple data layers. This will change a lot of social practices, such as dating, job interviewing and professional networking, and gaming, as well as policing and espionage.”

Aron Roberts, software developer at the University of California-Berkeley, said, “We may well see wearable devices and/or home and workplace sensors that can help us make ongoing lifestyle changes and provide early detection for disease risks, not just disease. We may literally be able to adjust both medications and lifestyle changes on a day-by-day basis or even an hour-by-hour basis, thus enormously magnifying the effectiveness of an ever more understaffed medical delivery system.”

5) Political awareness and action will be facilitated and more peaceful change and public uprisings like the Arab Spring will emerge.

Rui Correia, director of Netday Namibia, a non-profit supporting innovations in information technology for education and development, wrote, “With mobile technologies and information-sharing apps becoming ubiquitous, we can expect some significant improvement in the awareness of otherwise illiterate and ill-informed rural populations to opportunities missed out by manipulative and corrupt governments. Like the Arab Spring, we can expect more and more uprisings to take place as people become more informed and able to communicate their concerns.”

Nicole Ellison, an associate professor in the School of Information at the University of Michigan, predicted, "As more of the global population comes online, there will be increased awareness of the massive disparities in access to health care, clear water, education, food, and human rights."

6) The spread of the 'Ubernet' will diminish the meaning of borders, and new 'nations' of those with shared interests may emerge and exist beyond the capacity of current nation-states to control.

David Hughes, an Internet pioneer, who from 1972 worked in individual to/from digital telecommunications, responded, "All 7-plus billion humans on this planet will sooner or later be 'connected' to each other and fixed destinations, via the Uber(not Inter)net. That *can* lead to the diminished power over people's lives within nation-states. When every person on this planet can reach, and communicate two-way, with every other person on this planet, the power of nation-states to control every human inside its geographic boundaries may start to diminish."

JP Rangaswami, chief scientist for Salesforce.com, observed, "The problems that humanity now faces are problems that can't be contained by political borders or economic systems. Traditional structures of government and governance are therefore ill-equipped to create the sensors, the flows, the ability to recognize patterns, the ability to identify root causes, the ability to act on the insights gained, the ability to do any or all of this at speed, while working collaboratively across borders and time zones and sociopolitical systems and cultures. From climate change to disease control, from water conservation to nutrition, from the resolution of immune-system-weakness conditions to solving the growing obesity problem, the answer lies in what the Internet will be in decades to come. By 2025, we will have a good idea of its foundations."

7) The Internet will become 'the Internets' as access, systems, and principles are renegotiated

David Brin, author and futurist, responded, "There will be many Internets. Mesh networks will self-form and we'll deputize sub-selves to dwell in many places."

Sean Mead, senior director of strategy and analytics for Interbrand, predicted, "The Internet will generate several new related networks. Some will require verified identification to access, while others will promise increased privacy."

Ian Peter, pioneer Internet activist and Internet rights advocate, wrote, "The Internet will fragment. Global connectivity will continue to exist, but through a series of separate channels controlled by a series of separate protocols. Our use of separate channels for separate applications will be necessitated by security problems, cyber policy of nations and corporations, and our continued attempts to find better ways to do things."

8) An Internet-enabled revolution in education will spread more opportunities, with less money spent on real estate and teachers.

Hal Varian, chief economist for Google, wrote, “The biggest impact on the world will be universal access to all human knowledge. The smartest person in the world currently could well be stuck behind a plow in India or China. Enabling that person — and the millions like him or her — will have a profound impact on the development of the human race. Cheap mobile devices will be available worldwide, and educational tools like the Khan Academy will be available to everyone. This will have a huge impact on literacy and numeracy and will lead to a more informed and more educated world population.”

A generally hopeful summary comes from **Doc Searls**, journalist and director of ProjectVRM at Harvard’s Berkman Center for Internet and Society, observed, “Of course, there will be bad acting by some, taking advantage of organizational vulnerabilities and gaming systems in other ways. Organizations in the meantime will continue rationalizing negative externalities, such as we see today with pollution of the Internet’s pathways by boundless wasted advertising messages, and bots working to game the same business. But ... civilization deals with bad acting through development of manners, norms, laws and regulations. Expect all of those to emerge and evolve over the coming years. But don’t expect the Internet to go away ... Will the Internet make it possible for our entire civilization to collapse together, in one big awful heap? Possibly. But the Internet has already made it possible for us to use one of our unique graces — the ability to share knowledge — for good, and to a degree never before possible.”

Less-hopeful theses

9) Dangerous divides between haves and have-nots may expand, resulting in resentment and possible violence.

Oscar Gandy, an emeritus professor at the Annenberg School, University of Pennsylvania, explained, “We have to think seriously about the kinds of conflicts that will arise in response to the growing inequality enabled and amplified by means of networked transactions that benefit smaller and smaller segments of the global population. Social media will facilitate and amplify the feelings of loss and abuse. They will also facilitate the sharing of examples and instructions about how to challenge, resist, and/or punish what will increasingly come to be seen as unjust.”

10) Abuses and abusers will ‘evolve and scale.’ Human nature isn’t changing; there’s laziness, bullying, stalking, stupidity, pornography, dirty tricks, crime, and those who practice them have new capacity to make life miserable for others.

Llewellyn Kriel, CEO and editor in chief of TopEditor International Media Services, predicted, “Everything — every thing — will be available online with price tags attached. Cyber-terrorism will become commonplace. Privacy and confidentiality of any and all personal will become a thing of the past. Online ‘diseases’ — mental, physical, social, addictions (psycho-cyber drugs) — will affect families and communities and spread willy-nilly across borders. The digital divide will grow and worsen beyond the control of nations or global organizations such as the UN. This will increasingly polarize the planet between haves and have-nots. Global companies will exploit this polarization. Digital criminal networks will become realities of the new frontiers. Terrorism, both by organizations and individuals, will be daily realities. The world will become less and less safe, and only personal skills and insights will protect individuals.”

An antispam and security architect predicted, “There will be an erosion of privacy and the use of dirty-tricks social media will emerge more and more in election campaigns. Abusers evolve and scale far more than regular Internet users.”

A retired management consultant to a large international corporation wrote, “There will be greater group-think, group-speak and mob mentality ... More uninformed individuals will influence others to the detriment of standard of living and effective government.”

11) Pressured by these changes, governments and corporations will try to assert power — and at times succeed — as they invoke security and cultural norms.

Paul Babbitt, an associate professor at Southern Arkansas University, predicted, “Governments will become much more effective in using the Internet as an instrument of political and social control. That is, filters will be increasingly valuable and important, and effective and useful filters will be able to charge for their services. People will be more than happy to trade the free-wheeling aspect common to many Internet sites for more structured and regulated environments.”

Anoop Ghanwani, a distinguished engineer at Dell, said, “Regulation will always stand in the way of anything significant happening.”

12) People will continue — sometimes grudgingly — to make tradeoffs favoring convenience and perceived immediate gains over privacy; and privacy will be something only the upscale will enjoy.

An anonymous respondent wrote, “Yes, the information we want will increasingly find its way to us, as networks learn to accurately predict our interests and weaknesses. But that will also tempt us to stop seeking out knowledge, narrowing our horizons, even as we delve evermore deep. The privacy premium may also be a factor: only the relatively well-off (and well-educated) will know how to preserve their privacy in 2025.”

13) Humans and their current organizations may not respond quickly enough to challenges presented by complex networks.

Randy Kluger, an associate professor of communication at Texas A&M University, responded, “The most neglected aspect of the impact is in the geopolitics of the Internet. There are very few experts focused on this, and yet the rise of digital media promises significant disruption to relations between and among states. Some of the really important dimensions include the development of transnational political actors/movements, the rise of the virtual state, the impact of digital diplomacy efforts, the role of information in undermining state privilege (think Wikileaks), and ... the development of cyber-conflict (in both symmetric and asymmetric forms).”

A librarian shared a quote from Albert Einstein: “It has become appallingly clear that our technology has surpassed our humanity.”

14) Most people are not yet noticing the profound changes today’s communications networks are already bringing about; these networks will be even more disruptive in the future.

Nishant Shah, visiting professor at the Centre for Digital Cultures at Leuphana University, Germany, observed, “It is going to systemically change our understandings of being human, being social, and being political. It is not merely a tool of enforcing existing systems; it is a structural change in the systems that we are used to. And this means that we are truly going through a paradigm shift — which is celebratory for what it brings, but it also produces great precariousness because existing structures lose meaning and valence, and hence, a new world order needs to be produced in order to accommodate for these new modes of being and operation. The greatest impact of the Internet is what we are already witnessing, but it is going to accelerate.”

A summary of the less-hopeful theses comes from **Bob Briscoe**, chief researcher in networking and infrastructure for British Telecom, who predicted, “The greatest impacts of the Internet will continue to be the side-effects that tower so high that we do not notice they are continuing to grow

far above us: 1) More people will lose their grounding in the realities of life and work, instead considering those aspects of the world amenable to expression as information as if they were the whole world. 2) The scale of the interactions possible over the Internet will tempt more and more people into more interactions than they are capable of sustaining, which on average will continue to lead each interaction to be more superficial. 3) Given there is strong evidence that people are much more willing to commit petty crimes against people and organizations when they have no face-to-face interaction, the increasing proportion of human interactions mediated by the Internet will continue the trend toward less respect and less integrity in our relations."

Advice: Make good choices today

15) Foresight and accurate predictions can make a difference; 'The best way to predict the future is to invent it.'

Robert Cannon, Internet law and policy expert, wrote, "The Internet, automation, and robotics will disrupt the economy as we know it. How will we provide for the humans who can no longer earn money through labor? The opportunities are simply tremendous. Information, the ability to understand that information, and the ability to act on that information will be available ubiquitously ... Or we could become a 'brave new world' were the government (or corporate power) knows everything about everyone everywhere and every move can be foreseen, and society is taken over by the elite with control of the technology... The good news is that the technology that promises to turn our world on its head is also the technology with which we can build our new world. It offers an unbridled ability to collaborate, share, and interact. 'The best way to predict the future is to invent it.' It is a very good time to start inventing the future."

Sonigitu Asibong Ekpe, a consultant with the AgeCare Foundation, a non-profit organization, observed, "The most significant impact of the Internet is getting us to imagine different paths that the future may take. These paths help us to be better prepared for long-term contingencies; by identifying key indicators, and amplifying signals of change, they help us ensure that our decisions along the way are flexible enough to accommodate change... That billions more people are poised to come online in the emerging economies seems certain. Yet much remains uncertain: from who will have access, how, when, and at what price to the Internet's role as an engine for innovation and the creation of commercial, social, and human value. As users, industry players, and policymakers, the interplay of decisions that we make today and in the near future will determine the evolution of the Internet and the shape it takes by 2025, in both intended and unintended ways. Regardless of how the future unfolds, the Internet will evolve in ways we can only begin to imagine. By allowing ourselves to explore and rehearse divergent and plausible futures for the Internet, not only do we prepare for any future, we can also help shape it for the better."

The Gurus Speak

Among the experts who contributed to this project were some of the most prominent Internet analysts of our generation. Here we highlight the predictions of some of the people most deeply involved in shaping our digital present.

New business models, Internet voting, privacy, MOOCs

Vint Cerf, Google vice president and chief Internet evangelist, predicted, “There will be increased franchise and information sharing. There will be changes to business models to adapt to the economics of digital communication and storage. We may finally get to Internet voting, but only if we have really strong authentication methods available. Privacy must be improved but transparency about what information is retained about users also has to increase. More business will be born online with a global market from the beginning. Massive open online courses (MOOCs) will become important revenue streams.”

‘Potential for a very dystopian world’

John Markoff, senior writer for the Science section of the *New York Times*, wrote, “What happens the first time you answer the phone and hear from your mother or a close friend, but it's actually not, and instead, it's a piece of malware that is designed to social engineer you. What kind of a world will we have crossed over into? I basically began as an Internet utopian (think John Perry Barlow), but I have since realized that the technical and social forces that have been unleashed by the microprocessor hold out the potential of a very dystopian world that is also profoundly inequalitarian. I often find myself thinking, ‘Who said it would get better?’”

‘More seamless and integrated’

danah boyd, a research scientist for Microsoft, responded, “People will continue to connect to people and information, and it will become more seamless and integrated into every aspect of daily life. We're there in certain populations already, but it will be more widespread in 12 years.”

Exposure of human gaps between belief and activity

Jonathan Grudin, principal researcher for Microsoft Research, wrote, “The most significant impact of the Internet is that, by making so much activity visible, it exposes the gap between the way we think people behave, the way we think they ought to behave, the laws and regulations and policies and processes and conventions we have developed to guide behavior — and the way they really behave. This is happening in families, in organizations, in communities, and in society more broadly. Adjusting to this will be an unending, difficult task. We often or usually formulate rules knowing they won't always apply, and ignore inconsequential violations, but now that is more

difficult — the violations are visible, selective enforcement is visible, yet formulating more nuanced rules would leave us with little time to do anything else. Exposing violations can be good, when the behavior is reprehensible. Exposing harmless violations can impede efficiency. Behavior observed digitally, without the full context, can be misunderstood. Are we built to function without some illusions that technology strips away? Are we better off and happier when all of our leaders are revealed to have flaws or feet of clay? Human beings are flexible, yet we have some fundamental social and emotional responses; how technology will affect these must be worked out.”

We have entered the ‘post-normal’ world

Stowe Boyd, lead researcher for GigaOM Research, took many overlapping influences into consideration in his response, also figuring in the influences of robots and asking, “What are people for?” He predicted: “The Web will be the single most foundational aspect of people’s lives in 2025. People’s companion devices — the 2025 equivalent of today’s phones and tablets — will be the first thing they touch in the morning and the last thing they put down to sleep. In fact, some people will go so far as to have elements of their devices embedded. The AI-mediated, goggle-channelled social interactions of the near future will be as unlike what we are doing today, as today’s social Web is to what came before. The ephemeralization of work by AI and bots will signal the outer boundary of the industrial age, when we first harnessed the power of steam and electricity to amplify and displace human labor, and now we see that culminating in a possible near-zero workforce. We have already entered the post-normal, where the economics of the late industrial era have turned inside out, where the complexity of interconnected globalism has led to uncertainty of such a degree that it is increasingly impossible to find low-risk paths forward, or to even determine if they exist. A new set of principles is needed to operate in the world that the Web made, and we’d better figure them out damn fast. My bet is that the cure is more Web: a more connected world. But one connected in different ways, for different ends, and not as a way to prop up the mistakes and inequities of the past, but instead as a means to answer the key question of the new age we are barreling into: What are people for?”

Powerful trends intersect

Jim Hendler, a professor of Computer Science at Rensselaer Polytechnic Institute, wrote, “Three forces will continue to interact, weaving a braid that will be evolutionary, rather than revolutionary. These are the increasing ease of sharing information (and the threat that makes to privacy); the increasing needs of business, and desires of individuals, to interact with people outside one’s own physical locale; and the increasing change in the use of AI/robotics in the workplace displacing more and more workers. 2025 will be around the time that the intersections of these, and other forces, will be starting to cause major changes in where people live, what they

do with their time (and what work is), and how they interact beyond the local situation. It won't look all that different from today, but major forces will be starting to well."

The Edison doctrine should return

Marc Rotenberg, president of the Electronic Privacy Information Center, said, "I hope there will be greater openness, more democratic participation, less centralized control, and greater freedom. But there is nothing predetermined about that outcome. Economic and political forces in the United States are pulling in the opposite direction. So, we are left with a central challenge: will the Internet of 2025 be — a network of freedom and opportunity or the infrastructure of social control? In the words of Thomas Edison, 'What man creates with his hand, he should control with his head.'"

The 'ghost of Gutenberg' reappears and cautions humility in predictions

Jeff Jarvis, director of the Tow-Knight Center for Entrepreneurial Journalism at the City University of New York Graduate School of Journalism, wrote, "You give me no choice but to raise the ghost of Gutenberg and point out that, according to the greatest scholar on the topic, Elizabeth Eisenstein, the impact of the book on society was not fully realized until 100 years after the invention of the press. The book itself did not take on its own shape in form, content, and business model, departing from its scribal roots, until half a century after Gutenberg. The impact of the press — the physical impression of ink on paper — is only now, 600 years later, diminishing. In the development of the net and its impact on society, we are at 1472 in Gutenberg years. John Naughton, a columnist for London's Observer, asks us to imagine the good citizens of Gutenberg's hometown, Mainz, using Gutenberg's folly to predict the undermining of the authority of the Catholic Church; the birth of the Reformation and scientific revolution; the transformation of education, changing our sense even of childhood; and I would add, upheaval in our notion of nations. Today, we wouldn't know our Martin Luther if he hammered on our door. Consider the change brought by the web its first 20 years and now you ask us to predict the next dozen? Sorry."

The age of the 'global supercomputer'

Mike Liebhold, senior researcher and distinguished fellow at the Institute for the Future, commented, "The Internet is morphing from the global library into the global supercomputer. By 2025, almost every application or service we can imagine will be enhanced by the application of enormous computation enabling widespread applications of capabilities like mining, inference, recognition, sense-making, rendering modeling as well as proactive contextual computing."

The fundamental unanswered questions

David Weinberger, senior researcher at Harvard's Berkman Center for Internet and Society, responded, "The future of the Internet depends on many imponderables, including whether the Internet gets sold to the access and content providers."

Internet access will become a 'human right'

Tiffany Shlain, creator of the AOL series *The Future Starts Here*, and founder of The Webby Awards, responded, "Access to the Internet will be a international human right. The diversity of perspectives from all different parts of the globe tackling some of our biggest problems will lead to breakthroughs we can't imagine on issues such as poverty, inequality, and the environment."

A 'balkanized' system

Paul Saffo, the managing director of Discern Analytics and consulting associate professor at Stanford, wrote, "The pressures to balkanize the global Internet will continue and create new uncertainties. Governments will become more skilled at blocking access to unwelcome sites."

Threats persist

Fred Baker, Internet pioneer and Cisco Systems Fellow, responded, "The issues in security and privacy will have been improved in important ways, but will remain threats, primarily because human nature will not have changed, and there is always a percentage of people who seek to harm others."

We need more agreements to make the future work

Seth Finkelstein, a prominent longtime programmer and consultant, argued, "When one combines Free Trade ideology with the ease of information flow, the entities which deal in data and content and associated items are going to need to have a set of agreements that work for the breadth of the Internet (assuming the world doesn't fragment into isolated areas, which seems very unlikely in the modern economy)."

Pithy Additions — Trendhouses, Microjobs, Metadevices, More

The following are additional highlights from some of the predictions that had a summary quality to them or added new thoughts to the mix that extended beyond the theses or used especially vivid language:

Bob Frankston, Internet pioneer and technology innovator, said, “Once we get past the gatekeeper-based model of funding our ability to communicate we’ll start to rethink how we create systems. We’ll just assume, for example, that a medical monitor will ‘just work’ wherever we are and if we show symptoms of a heart attack in the next hour an ambulance will be there to meet us. We’ll continue to define new topologies for social relationships and trust that they are less tied to geography. We’ll also see the rise of metadevices and understandings, some of which is latent in the terms big data and Internet of Things — terms that will fade away because reality will be far more interesting.”

Jerry Michalski, founder of REX, the Relationship Economy eXpedition, observed, “The Internet gives us *Persistence* — the ability to leave things for one another in cyberspace, freely. This is a big deal we haven’t yet comprehended. Right now, we are obsessed with flow, with the immediate, with the evanescent. Persistence lets us collaborate for the long term, which is what we’ll slowly learn to do ... We will begin to design institutions from a basis of trust of the average person, instead of mistrust, the way we’ve been designing for a few centuries. This will let us build very different institutions for learning, culture, creativity, and more.”

Laurel Papworth, social media educator, wrote, “Gamification sees the workplace change to microjobs, measured and monitored. Personal reputation is quantified by scoring systems and algorithms so complicated that only the bots that change them by the microsecond can understand them. The current walls that separate humanity (demographics, psychographics) will diminish, and after a massive trolling war, value systems will be re-established with people fearful to say what they really think, in case their personal reputation score — online, viewable, actionable — diminishes. X Factor 2025 continues to rate well.”

Andrew Chen, associate professor of computer science at Minnesota State University Moorhead (MN), responded, “The Internet is a dangerous place — it spreads vice easily. The Internet is a powerful place — it enables oppressed peoples to gather together and achieve power through a shared voice. The Internet is a seductive place — it provides multiple opportunities for people to ignore the rest of their lives. The Internet is a chimera — it starts out seeming powerful, then it becomes seductive, and then it becomes dangerous. The Internet is the fullest expression of human nature — and how you see it reflects you more than anything else. The Internet has already

impacted too much. The seductive aspects are the worst. As people forsake the rest of their lives, it becomes a drain on humanity that transforms humans into just small parts of the Internet, whereas it should be that the Internet is a small part of human life.”

Mikey O'Connor, an elected representative to ICANN’s GNSO Council, representing the ISP and Connectivity Provider Constituency, wrote, “The Internet will be used as the most effective force of mind control the planet has ever seen, leaving the Madison Avenue revolution as a piddling, small thing by comparison.”

Andrew Bridges, partner, Internet law litigator and policy analyst at Fenwick & West LLP, wrote, “The Internet will facilitate the fundamental threat of governmental control — the threats to free speech, free association and assembly resulting from governmental surveillance and control; the loss of any sense of a private sphere of conduct as a result, with psychological, social, and political consequences; and the division of citizen bodies into the watchers and the watched. It will happen because of the power of governments to hide their actions while exposing the actions of all others to their own scrutiny; the abandonment of the rule of law, which should but will not apply impartially to all sectors of society, politics, and the economy; and the willing sacrifice of Constitutional values by those who unpatriotically value their own short-term physical security over our long-term bedrock political principles.”

Marcel Bullinga, futurist and author of *Welcome to the Future Cloud — 2025 in 100 Predictions*, responded, “The future will be cheap — due to the fact we can print everything, know almost everything, and share everything: knowledge, innovation, infrastructure. The future will also be highly competitive, raising much social distress, and we will suffer from a massive lack of focus and mindfulness. The key to the future is not ownership but access. We need trendhouses: houses that we do not own, but that we are subscribed to. We need a subscription to health-, living-, and energy services. Spotify-houses and Ikea-homes in one.”

Evan Michelson, a researcher exploring the societal and policy implications of emerging technologies, wrote, “The biggest impact of the Internet is that it will no longer allow for reasoned consideration of complex social challenges. What the Internet will do is make it more difficult to contemplate the longer-term implications of decisions made today. The future will, unfortunately, suffer in service of the present.”

Andrew Nachison, co-founder of We Media, said, “There will be more communication, more education, more media, more economic activity, more dissent, more entertainment, more convenience, more angst, more inequality and more conflict. Ideas will spread everywhere, but people will continue to clash over beliefs and values.

David Solomonoff, president of the New York chapter of the Internet Society, "I think that digital currencies and 3D printing (with open source designs distributed via the Internet) are two areas where the roles of government and large commercial/industrial entities will be challenged. Again, those that accommodate these changes will succeed, those that don't will be in a state of decline. The relationships between citizen/consumer and government/corporation will need to be more consensual and based on trust rather than coercion."

About the Survey

The expert predictions reported here about the impact of the Internet over the next ten years came in response to one of eight questions asked by the Pew Research Center's Internet & American Life Project and Elon University's Imagining the Internet Center in an online canvassing conducted between November 25, 2013 and January 13, 2014. This is the sixth Imagining the Internet Study the two organizations have conducted [together](#). For this project, we invited more than 12,000 experts and members of the interested public to share their opinions on the likely future of the Internet and 2,551 responded to at least one of the questions in the survey. In all, 1,867 responded to this open-ended question.

The Web-based survey was fielded to three audiences. The first audience was a list of targeted experts identified and accumulated by Pew Research and Elon University during the five previous rounds of this study, as well as those identified across 12 years of studying the Internet realm during its formative years. The second wave of solicitation was targeted to prominent listservs of Internet analysts, including the scholarly Association of Internet Researchers, Internet Rights and Principles, Liberation and Technology, American Political Science Association, Cybertelecom, the Communication and Information Technologies section of the American Sociological Association, and others. The third audience was the mailing list of the Pew Research Center Internet Project, which includes those who closely follow technology trends, data, and who are often builders of parts of the online world. While most people who responded to the survey live in North America, people from across the world were invited to participate.

Respondents gave their answers to the following prompt:

Most significant impacts of the Internet — This is an open-ended question allowing you to make your own prediction about the role of the Internet in people's lives in 2025 and the impact it will have on social, economic and political processes. Good and/or bad, what do you expect to be the most significant overall impacts of our uses of the Internet on humanity between now and 2025?

Since the data are based on a non-random sample, the results are not projectable to any population other than the individuals expressing their points of view in this sample. The respondents' remarks reflect their personal positions and are not the positions of their employers; the descriptions of their leadership roles help identify their background and the locus of their expertise. About 84% of respondents identified themselves as being based in North America; the others hail from all corners of the world. When asked about their "primary area of Internet interest," 19% identified themselves as research scientists; 9% said they were entrepreneurs or business leaders; 10% as authors, editors or journalists; 8% as technology developers or

administrators; 8% as advocates or activist users; 7% said they were futurists or consultants; 2% as legislators, politicians or lawyers; 2% as pioneers or originators; and 33% specified their primary area of interest as “other.”

About half of the expert survey respondents elected to remain anonymous. Because people’s level of expertise is an important element of their participation in the conversation, anonymous respondents were given the opportunity to share a description of their Internet expertise or background.

The survey is the sixth *Future of the Internet* survey conducted by Pew Research and Elon. In the first survey, fielded in late 2004 and published a decade ago in 2005, when respondents were asked about how they saw the influence of the Internet unfolding, the vast majority shared primarily optimistic viewpoints about positive impacts that might emerge. In this survey, most respondents easily identified downsides to a highly networked future, suggesting that analysts are much more experienced with and aware of the threats of connectivity today than they were a decade ago.

Some of the key respondents in this report:

Jari Arkko of Ericsson, chair of the Internet Engineering Task Force; **Geoff Arnold**, a Cisco principal engineer; **Rob Atkinson**, president of the Information Technology and Innovation Foundation; **Fred Baker**, Cisco Systems Fellow; **danah boyd**, a social scientist for Microsoft; **Stowe Boyd**, lead at GigaOM Research; **David Brin**, futurist and author; **Bob Briscoe**, chief researcher for British Telecom; **Vint Cerf**, vice president and chief Internet evangelist at Google; **David Clark**, senior scientist at MIT’s Computer Science and Artificial Intelligence Laboratory; **David Cohn**, director of news for Circa; **Glenn Edens**, research scientist at PARC and IETF area chair; **Bob Frankston**, Internet pioneer and technology innovator; **Steve Goldstein**, longtime National Science Foundation leader; **Jonathan Grudin**, principal researcher for Microsoft; **Jim Hendler**, Semantic Web scientist and professor at Rensselaer Polytechnic Institute; **Bob Hinden**, chair of Check Point Software and chair of the board for the Internet Society; **Jeff Jarvis**, director of the Tow-Knight Center at the City University of New York; **Jim Kennedy**, senior vice president for strategy for the Associated Press; **Mike Liebhold**, distinguished fellow at the Institute for the Future; **Dan Lynch**, founder of Interop and former director of computing facilities at SRI International; **Isaac Mao**, chief architect of Sharism Lab; **John Markoff**, senior writer for the Science section of the *New York Times*; **Ian Peter**, pioneer Internet activist and Internet rights advocate; **Craig Newmark**, founder of Craig’s List; **Raymond Plzak**, former CEO of the American Registry for Internet Numbers, now a member of the board of ICANN;

Jason Pontin, editor in chief and publisher of MIT Technology Review; **JP Rangaswami**, chief scientist for Salesforce.com; **Howard Rheingold**, pioneering Internet sociologist and self-employed writer, consultant, and educator; **Mike Roberts**, Internet pioneer and longtime leader with ICANN; **Marc Rotenberg**, president of the Electronic Privacy Information Center; **Paul Saffo**, managing director of Discern Analytics and consulting associate professor at Stanford; **Doc Searls**, director of ProjectVRM at Harvard's Berkman Center; **Tom Standage**, digital editor for *The Economist*; **Tapio Varis**, chair in global e-learning for UNESCO; **Jillian C. York**, director for international freedom of expression for the Electronic Frontier Foundation; **Hal Varian**, chief economist for Google; and **David Weinberger**, senior researcher at Harvard's Berkman Center.

A selection of other institutions at which respondents work or have affiliations:

Yahoo; Intel; IBM; Hewlett-Packard; Nokia; Amazon; Netflix; Verizon; PayPal; BBN; Comcast; US Congress; EFF; W3C; The Web Foundation; PIRG; NASA; Association of Internet Researchers; Bloomberg News; World Future Society; ACM; the Aspen Institute; Magid; GigaOm; the Markle Foundation; The Altimeter Group; FactCheck.org; key offices of US and European Union governments; the Internet Engineering Task Force; the Internet Hall of Fame; ARIN; Nominet; Oxford Internet Institute; Princeton, Yale, Brown, Georgetown, Carnegie-Mellon, Duke, Purdue, Florida State and Columbia Universities; the universities of Pennsylvania, California-Berkeley, Southern California, North Carolina-Chapel Hill, Kentucky, Maryland, Kansas, Texas-Austin, Illinois-Urbana-Champaign, the Georgia Institute of Technology, and Boston College.

Complete sets of for-credit and anonymous responses to this survey question, can be found here:

http://www.elon.edu/e-web/imagining/surveys/2014_survey/2025_Internet_Impact.xhtml
http://www.elon.edu/e-web/imagining/surveys/2014_survey/2025_Internet_Impact_credit.xhtml
http://www.elon.edu/e-web/imagining/surveys/2014_survey/2025_Internet_Impact_anon.xhtml

The More-Hopeful Theses

This report reflects the responses to the sixth *Future of the Internet* survey, a canvassing of experts about their attitudes on the likely future impacts of evolving communications networks. Experts' remarks in the previous five surveys generally expressed enthusiasm about the potential benefits of technological evolution. In this, the 2014 survey, their optimistic responses are more often accompanied by their concerns over the potential negatives that go hand-in-hand with the connectivity.

One striking pattern is that these experts agree to a large extent on the trends that will shape digital technology in the next decade. Among those expected to extend through 2025 are:

- A global, immersive, invisible, ambient networked computing environment built through the continued proliferation of smart sensors, cameras, software, databases, and massive data centers in a world-spanning information fabric known as the Internet of Things.
- "Augmented reality" enhancements to the real-world input that people perceive through the use of portable/wearable/implantable technologies.
- A continuing evolution of artificial intelligence-equipped tools allowing anyone to connect to a globe-spanning information network nearly anywhere, anytime.
- Disruption of business models established in the 20th century (most notably impacting finance, entertainment, publishers of all sorts, and education).
- Tagging, databasing, and intelligent analytical mapping of the physical and social realms.

Following are responses selected from nearly 1,867 survey participants who answered this question. Some responses are edited. The experts' statements are grouped under headings that indicate the major themes emerging from the overall set of responses. The headings reflect the predominant opinions found in respondents' replies; they are the same as those described in brief in the opening pages of this report.

1) Information sharing over the Internet will be so effortlessly interwoven into daily life that it will become invisible, flowing like electricity, often through machine intermediaries.

A significant number of respondents noted that people will come to take the Internet for granted in 2025. Many drew comparisons to the casual use of electricity in most developed areas of the

world and people's expectation that it will be readily available anywhere anytime at an extremely low cost.

For instance, **Joe Touch**, director of the USC/ISI Postel Center, responded, "The Internet will shift from the place we find cat videos to a background capability that will be a seamless part of how we live our everyday lives. We won't think about 'going online' or 'looking on the Internet' for something — we'll just be online, and just look. Author William Gibson was wrong — there's no cyberspace; it's all just 'space.' ...We don't ask people how electricity or the internal combustion engine will change their lives a decade from now — they're ubiquitous, seamless parts of everyday life. Arthur Clarke said that any sufficiently advanced technology is indistinguishable from magic, but that's just during the start of its adoption. Ultimately, any sufficiently useful technology fades into the background if it's done right."

Anonymously, a database configuration specialist and risk assessment analyst wrote, "By 2025 use of the Internet will be as routine as breathing. It will change from something you decide to use to something you simply use."

Isaac Mao, chief architect of Sharism Lab, noted, "Connectivity will be anywhere and anytime. People will choose it for free and with different levels of choices."

Riel Miller, the head of foresight for UNESCO, based in Paris, wrote, "Like laws, markets, libraries, behavioral norms — all attributes of living in a community — the Net will just be part of daily life."

Jim Kennedy, senior vice president for strategy for the Associated Press, responded, "Never being without a direct, immediate connection to information and other human beings will be the great boon of the advanced Internet age. Every sensory or intellectual experience that we know today could be extended to some degree. The great risk is that we will fail to harness that power in ways that are more useful than useless and more beneficial to our world than harmful. Enabling the flow of information to be constant and contextual at the same time will unleash opportunity in almost every realm of our experience."

Dave Rusin, a digital entrepreneur and global corporate executive, wrote, "We are on information overload; people want peace in their lives, predictability, media truth and delivered/accessed/trust, they want to go back to basics, family, simplicity, and a sense of tangible community."

When people come to depend on such a system, things grind to a halt when it is not available. Several survey respondents pointed this out. **Anonymously**, a minority rights advocate and media analyst, teacher, and journalist wrote, "Disruptions in access to the Internet will be one of

the most remarkable features of the next 15 years; people will realize they need back-up systems. It will be important to know how to live in the Net, repair the Net, escape the Net, and live outside the Net."

Maurice Vergeer, researcher in communication science at Radboud University in the Netherlands, said, "Concerning the bad things that can be done with the Internet and big data, it's a rat race between those with good and bad intentions in terms of setting up security and hacking that same security. The problem is that increasingly more people are dependent in it. So, any damage that'll be done will affect more and more people. Whereas we've seen an increase of people and organisations get connected, maybe in the future we will see a trend towards more disconnected niches. In terms of communities of interests this would result in extreme cyber-balkanization."

Because it will be so ubiquitous and essential, some respondents foresee Internet access becoming a right and the development of technology skills as the next big literacy challenge.

Pamela Rutledge from the Media Psychology Research Center, argued, "By 2025, Internet access will be considered a 'right' and will replace the 'universal access' currently reserved for phone lines. Increased access and greater capabilities will change the digital divide from access to quality of tools and the skills required for digital participation."

Survey participants also acknowledged the fact that global dependence on one particular system makes it a prime target for a devastating attack.

Robert E. McGrath, a retired software engineer who participated in critical developments of the World Wide Web, wrote, "The odds are 50/50 that the Internet will be effectively destroyed by cyberattacks by 2025. If the Net goes down, there will be terrible costs as we reboot the economy."

There were also concerns expressed about how the exchange of information on the Internet might be controlled.

Anonymously, an intelligence analyst for a medical publisher wrote, "The Internet will be integral to everything we do, and it will be used to monitor, change, and measure social, economic, and political policies, processes, and goals. The danger is that it can be misused, and disinformation is in play to make such changes. The benefit is that with an open Internet, this can be crowd-controlled and that there are non-traditional sources of information that balance such gaming of systems."

Anonymously, a technology developer/administrator employed by a large cable company responded, "Instead of being 'a thing you do,' it becomes second nature, to the point that it is

invisible unless it goes missing. Governments will still attempt to control that free exchange of information, with varying degrees of success.”

Some respondents pointed out that the number of humans online is surpassed by the number of machines, and networked communication in 2025 will be human to human, human to machine, and machine to machine.

David Clark, a senior research scientist at MIT’s Computer Science and Artificial Intelligence Laboratory, noted, “One important trend is the use of networks to hook devices together that communicate without the active participation of people. What is called machine-to-machine, or M2M, is a natural consequence of the increasing computerization of all the devices around us. Today, most of the interactions on the Internet still involve an active person, whether using the Web, using Facebook, or sending message or mail. Devices will more and more have their own patterns of communication, their own ‘social networks,’ which they use to share and aggregate information, and undertake automatic control and activation. More and more, humans will be in a world in which decisions are being made by an active set of cooperating devices. The Internet (and computer-mediated communication in general) will become more pervasive but less explicit and visible. It will, to some extent, blend into the background of all we do. Another important trend will be the increasingly diverse character of the Internet experience in different regions of the world. While the Internet is a force for globalization, it will become increasingly localized.”

Brian Behlendorf, Internet pioneer and board member of several non-profits and for-profits, predicted that people will feel the information network has become a “new sense.” He wrote, “By 2025, it will become more apparent that personal digital devices have become the uncredited third lobe of our brain, and network connections more like an extension of our own nervous system, a new sense, like seeing and hearing. Questions about our rights over our own devices and connections will treat them more like parts of our bodies and beings than some third-party thing that is a privilege to own or something we merely rent. It will force us to redefine what being human means — and what personhood means, in terms of the law, representative government, and every other issue.”

2) The spread of the Internet will enhance global connectivity that fosters more planetary relationships and less ignorance.

There was considerable commentary about how augmented connectivity drives economic, social, and political change. Many human tools that have come before the Internet have made a difference: transportation networks and the printing press, for instance, have played starring roles in the evolution of human interaction. The Internet trumps all previous technological breakthroughs in its capabilities for connectivity.

Mike Roberts, Internet pioneer and longtime leader with ICANN and the Internet Society, wrote, "The two biggest impacts are creating instantaneous global marketplaces that have materially improved daily lives and creating global social interaction mechanisms that are reaching across cultural, political, and religious barriers to improve human relations."

Tim Bray, an active participant in the Internet Engineering Task Force (IETF) and technology industry veteran, wrote, "There will be greater access to information in general, in particular Wikipedia, and lower friction in human communication. The cultural impact of Wikipedia is underestimated. Everyone now has instant free access to a huge repository of basic factual information about everything. I expect the miasma of myth and ignorance and conspiracy theory to recede to dark corners of the discourse of civilization, where nice people don't go. The change in the emotional landscape conferred by people being able to communicate very cheaply irrespective of geography is still only dimly understood

Geoff Arnold, a Cisco principal engineer, predicted, "Over the next 11 years, the major political and social changes will be the result of macroeconomic developments. The Internet will affect the 'how' of these changes but will only play a minor role in the 'what.'"

Fred Hapgood, a self-employed science and technology writer, wrote, "One significant impact of the Internet will be in allowing the global economy to become a lot more efficient. Some people think that our economies will not grow much in the future, either because we are unlikely to discover technologies with the leveraging power of electricity and networking and the internal combustion engine, or because we not going to find new increases in labor factors like the disemployment and education of agricultural workers and the jump in female participation. In many countries, the working population will actually decline. But it seems obvious that the global economy operates at a tiny fraction of its potential efficiency. Over the next twenty years, the Internet will allow this potential to be tapped, and that will lead to real increases in wealth, regardless of what happens with technology. An example might be crowdfunding or crowdfinancing. These Internet-based innovations make it much cheaper for startups to raise their investment capital. But there are a million examples."

Bill Woodcock, executive director for the Packet Clearing House, responded, "By far the largest impact of the Internet is the ability it gives people to inform themselves. In that sense, the most important service on the Internet is Wikipedia, followed by things like eBay and TradeMe, and even Amazon, not for the ability they give people to buy things in low-friction ways (which is also important), but for the ability they give people to see what things cost, and what people think about them. People complain about the Internet making scams possible, but those scams have always been possible; what wasn't easy before was for people to educate themselves, take advantage of the accumulation of the world's knowledge, to *protect* themselves against scams,

duplicitous middlemen, bad actors, and faulty products. It's also important that the Internet facilitates communities of interest, rather than communities of coincidental geographic proximity. People who would in prior generations have assumed themselves to be abnormal now find themselves at the centers of thriving communities."

Anonymously, an attorney responded, "The most significant impact of the Internet will be on our economy on a macro level. On a micro level, the most significant impact is in our communication. In terms of the economy, we are drawing to a point where money is no longer a tangible thing. No longer based on a system of gold, money is merely based on faith... Since currency is a faith-based system, alternative currencies like Bitcoin will crop up. These alternative currencies will not respect geo-political borders. It will be interesting to see if the entire world goes the way of the Euro and embraces a universal monetary system because of the Internet. In addition, as we monetize content, we are shifting from a production-based economy to an information economy. It will be interesting to see if this is a threat to democracy, or a boon. Information is necessary to a democracy where the people must make the decisions, and they are hopefully informed ones. However, if information is solely available in a monetized form, then only those who have money have information. And information is power.

Bryan Alexander, senior fellow at the National Institute for Technology in Liberal Education, wrote, "It will be a golden age of learning. It will be the best time in history for those who want to study. We will have more access to more material, more teachers, and more peers in more ways than ever before. It will bring a new age of work, as we face growing underemployment and unemployment due to automation. We will need to be rethinking what old models mean, like careers, meaningful work, and avocations. It will be a world more integrated than ever before. We will see more planetary friendships, rivalries, romances, work teams, study groups, and collaborations."

Ali Carr-Chellman, head of learning and performance systems at Pennsylvania State University, said online games can help reduce violence. "We will continue to utilize gaming for social betterment," he predicted. "Gaming will be a way that we see significant improvements in human conditions through competition and even through functional shedding of violent tendencies."

There were a few respondents who said perceptions of the positive potential are overblown.

Henning Schulzrinne, a technology developer and professor at Columbia University observed, "Generally, I see the Internet as a 10% solution — i.e., it can make things (very roughly) 10% more efficient or less costly. This is quite helpful in many situations, but is unlikely to reduce income inequality significantly, fundamentally change access to education or reduce carbon dioxide levels dramatically. The largest beneficial impact of networks, not just the Internet, may be in reducing

traffic accidents, just as simple aircraft-to-aircraft communications has dramatically reduced the occurrence of mid-air collisions.”

3) The Internet of Things, artificial intelligence, and big data will make people more aware of their world and their own behavior.

Computation capabilities have been growing exponentially. More research and development of ubiquitous computing and human-like artificial intelligence are expected by many experts to pay dividends over the next decade. Many survey respondents said the biggest impact by 2025 will be generated by the billions of smart sensors and devices carried or embedded in networked networks spread across the world — the “Internet of Things.”

Anonymously, the publisher of an Internet-futures-oriented publication wrote, “The Internet will be everywhere, embedded in all of our technologies. It will be so pervasive that it will define how the world works. The Internet of Things is the next frontier. Adoption will be driven by the prospect for improved efficiency, productivity, and the opportunity to create new high-value applications.”

Anonymously, an information consultant/developer responded, “The Internet and humanity will be one, for better or worse. The Internet of Things will be the most useful innovation, and the one that will catch most people unawares. In the same way that the Web caught on in the 1990s and then so quickly became just what every business used to communicate by the mid- to late-2000s, the Internet of Things will cause a sea change in the way people relate to products and the world around them.”

Katie Derthick, a PhD candidate in human-centered design and engineering at the University of Washington, responded, “Ubiquitous computing will help relieve the burden created by the current app-centric form of technological innovation and solution on our ability to manage our time, health, relationships, social skills, spirituality, presence, attention, and cultural and class divides. A social backlash is coming; it’s already building. The most powerful effect embedded/wearable devices and the Internet of Things will have is to free us from technology, while allowing us to continue to benefit from it to the same and an even greater degree... It will bring scientific advancement through international collaboration; increased constituent voice in political discourse; and a freedom from technology devices that will allow our attention to return to more subtle and fundamental aspects of living.”

Anonymously, a professor of biology wrote, “The big impact will be the rise of autonomous and distributed AIs. Intelligence is perhaps an emergent property of complex interconnections between relatively non-intelligent entities.”

Anonymously, a retired university professor and well-known science fiction writer predicted, “There may be AI collaboration and teaming between humans and the Internet at all scales of size, speed, and locality. The Internet of Things warfare can trump all possibilities. Imagine World War I as fought with year-2000 weapons of mass destruction. Such an outcome needs no monsters, just accidents and deadly foolish policies.”

Anonymously, an executive at a top-level domain name operator wrote, “Given continued advances in computing power, storage and AI, it seems likely we’ll see a major shift in how we interact via the Internet. This could be as meaningful as distance learning and telemedicine, or as mundane as consumption of adult content.”

Anonymously, an executive for national news organization wrote, “Artificial intelligence will be much more ubiquitous and will revolutionize how we travel, manufacture products, and communicate.”

The evolution of software tools to gather and analyze large sets of information gleaned from the collection and assessment of inputs from networked people and devices — a concept that has been dubbed with the shorthand label “big data” — is expected by many to have significant influence.

Kalev Leetaru, a Yahoo Fellow at Georgetown University, wrote, “The greatest impacts will come from the use of all of the data exhaust of people’s daily lives, as they become more intertwined with the digital heartbeat as a way of rendering society increasingly computable.”

Anonymously, a PhD candidate in educational technology predicted, “Personal/big data will be an increasing concern as large datasets about each person will be easier and easier to generate, track, and maintain. Furthermore, keeping this data secure will be perhaps the most important issue in technology and society in general.”

Hong Xue, director of the Institute for Internet Policy of Law at Beijing Normal University, wrote, “People will be living in a 1984-like, transparent world.”

Judith Donath, a fellow at Harvard University’s Berkman Center for Internet and Society, responded, “Enormous amounts of information about people will be available online. Not necessarily publicly, but within broad circles of connection. We will expect to see a detailed data history: years of photographs, comments, postings, assessments by others, etc. We’ll have a picture of how someone has spent their time, the depth of their commitment to their hobbies, causes, friends, and family. This will change how we think about people, how we establish trust, how we negotiate change, failure, and success.”

Deborah Lupton, a research professor on the faculty at the University of Canberra, Australia, responded, “Big data and predictive analytics will continue to have a major role in structuring people's knowledge about themselves and others' knowledge of them. While big data offer some benefits in terms of producing certain types of information about individuals and populations, there are major concerns about the use of predictive analytics to restrict the access of some individuals to social services, opportunities to travel to different countries, access insurance, gain entry to certain universities and to fields of employment, and so on. The potential for exacerbating discrimination and marginalisation of already disadvantaged groups is great. We need to continue to cast a critical eye on the practices and claims of big data. Not only do we need more data scientists, as some are contending, we need more social scientists and philosophers and even artists to challenge and provoke big data claims and practices. As the dominance of the use of big data increases, we need to expose its weaknesses and biases.”

Computation, big data, analytics, and the Internet of Things might possibly alter expectations in regard to human performance.

Andrew K. Przybylski, a University of Oxford research fellow, wrote, “I am hopeful that augmented intelligences may also help people to fact-check for everyday issues and challenges. This would really empower people in general.”

Anonymously, an information science professional responded, “We will live a land of data — from our home appliances to stores to our own health. Slogging through and not being overwhelmed by the data will be the trick to keeping sane and healthy in all aspects.”

Anonymously, a digital technology educator predicts that 2025 will see the world, “Finally achieving the goal of everyone being connected all the time to everyone else and to data sources of all kinds. The same goods/bads will apply as they do now, around issues like efficiency, access to knowledge, convenience and activism vs. social control, privacy intrusions, and signal-to-noise ratio.”

4) Augmented reality and wearable devices will be implemented to monitor and give quick feedback on daily life, especially tied to personal health.

Augmented reality is a descriptive used to explain the ways in which information layers added by networked devices can inform people in ways that were not possible before the wireless Internet.

Tom Standage, digital editor for *The Economist*, wrote, “We will see augmented reality as the new interface for information. Overlaying it on the real world will come to be seen as an enormous

shift; historically, there will be a period before and after the advent of the 'aug,' as some sci-fi writers call it. In retrospect, telephony and smartphones and social media and Wikipedia will be seen as mere steps towards this larger goal."

Daren C. Brabham, assistant professor at the Annenberg School for Communication & Journalism, University of Southern California, wrote, "The most significant impacts of the Internet on people's lives by 2025 will involve augmented reality applications. Augmented reality tools such as AR mobile browsers (like Layar) or wearables (like Google Glass) will become affordable and widespread, and we will grow accustomed to seeing the world through multiple data layers. This will change a lot of social practices, such as dating, job interviewing and professional networking, and gaming, as well as policing and espionage."

Anonymously, a senior systems administrator at a US university wrote, "Privacy issues will be outweighed by the perceived benefits of being online and interacting with others all the time. I see wearable, or even embedded, technology managing even the most mundane aspects of our daily lives, from what we need at the grocery store to when it's time to change A/C filters to scheduling routine medical appointments and tests."

A large number of survey respondents predicted the enhancement of health will have the most global impact by 2025, often citing the ability to practice a healthy lifestyle and detect, monitor, diagnose, and get advice or treatment for ailments remotely thanks to mobile or implanted networked devices.

Sunil Gunderia, a mobile strategist, responded, "Healthcare will significantly change as nanotech-based, real-time monitoring and predictive analytics will increase average lifespans."

Stephen Abram, a prominent library blogger, said, "The greatest impact will be on world health. Unfortunately I don't foresee the same impacts on the biggest causes of sadness - education, poverty, nutrition, etc. I pray that the political and global will be there to solve the big problems and not just the digital ones — global warming, war, under-employment, etc."

Aron Roberts, software developer at the University of California-Berkeley, said, "The most significant impacts of the Internet will likely come in the life sciences domain, including medicine and public health. Computing and communications — not just the Internet, per se, are starting to have transformational impacts in that domain, both in research findings and in day-to-day health care. Not only are we likely to benefit from personalized, rather than mass, medical treatment, we also may well see wearable devices and/or home and workplace sensors that can help us make ongoing lifestyle changes and provide early detection for disease risks, not just disease. We may literally be able to adjust both medications and lifestyle changes on a day-by-day basis or even an

hour-by-hour basis, thus enormously magnifying the effectiveness of an ever more understaffed medical delivery system."

Brad Berens, a research fellow at the USC Annenberg Center for the Digital Future, predicted, "Barring a catastrophic event, by 2025, we'll see a new commitment to personal, social, commercial, and political balance, both enabled by and in reaction to the Internet. The Internet's greatest strength is its ability to remove friction of all sorts, both negative business friction but also positive interpersonal friction. (Just think about your first slow dance.) Today, we have families ignoring each other at the dinner table as each member looks at his or her own screen, but at the same time a growing concern for our health has led to a rapid decrease in smoking, drinking soda, eating junk food and an increase in exercise. By 2025 we'll start to see more commitment to intellectual, digital and interpersonal wellness."

Anonymously, an advisor to a state government library wrote, "The greatest impact will be medical — due to wearable devices and 'telemedicine' — and more devices will be implanted. It will happen due to fewer doctors, more bandwidth (for those in cities or better off financially) and demand by the public and the interest of younger physicians. The data of the Internet of Things can be beneficial for individuals, especially when our own bodies start telling us things before we have symptoms."

Beth Bush, senior vice president for a major healthcare professionals association, responded, "Baby Boomers will continue to change and drive society. This means healthcare, longevity, and humanity will drive the economic and intellectual investments."

Wearable devices, such as Google Glass and various companies' smart watches and health and fitness-oriented wristbands, are beginning to make waves and raise questions.

Anonymously, an advisor to a state government library wrote, "Personal wearable devices will have faster acceptance if different manufacturers products 'talk' to one another. At which company or organization will it all reside? Will individuals have direct access to their own information and the big data that it will generate in union with others' data?"

There were those said health care should already have progressed much further than it has to this point.

Anonymously, a tenure-track professor at a private research university responded, "Transformation of healthcare... should be happening at a much faster pace than it is; the fact that healthcare industries have been so slow to change suggests to me that they are ripe for a major transformation, and that should yield radical improvements in patient care and coordination/information sharing among medical specialists."

Some survey respondents said the quantified life can be just too much.

Anonymously, a strategic intelligence analyst on digital, tech and telecom issues wrote, “We will need to wear devices to keep us from walking out into the street or off piers, etc. There will be increased cluelessness, shorter attention spans, and reduced literacy and critical thinking skills among the masses due to reliance on computing devices.”

Melissa Wyers, president of Breakthrough Strategies, said, “Healthcare will become cheaper and more self-administered. We will be able to ‘know’ everything very early in our lives but struggle to understand how to make our lives. Tech perfection will make human imperfection harder to bear. We will be expected to optimize every aspect of life every second of life. It will exhaust us. Instant will be the norm.”

5) Political awareness and action will be facilitated and more peaceful change and public uprisings like the Arab Spring will emerge.

When survey respondents wrote about the use of the Internet to leverage political strength from the grassroots, they often referred to the Arab Spring as representative of people power magnified by the ability to instantly communicate without censorship. Several experts said new tools are making it easier to identify problems and negative trends, to take action themselves, and to follow up by holding leaders accountable to take action.

Nicole Ellison, an associate professor in the School of Information at the University of Michigan, predicted, “As more of the global population comes online, there will be increased awareness of the massive disparities in access to health care, clear water, education, food, and human rights. I am hopeful that those of us in developed countries that have resources to spare will use them for good via new tools and technologies designed to help those in need. This may be via increased awareness and political action; it may be through micro-loans and other innovative economic mechanisms; it may be through crowd-sourced tutoring and educational practices; it may be via a mechanism that hasn't been invented yet. But I am hopeful the power of connectivity will result in increased awareness and empathy leading to real and necessary action.”

Some people boldly predicted that by 2025 current political hierarchies will be forced to be more open to public participation in government processes.

Jeremy Epstein, senior computer scientist at SRI International, currently working with the National Science Foundation as lead program director for Secure and Trustworthy Cyberspace, responded, “Combined with mass media, the Internet will increase the impact of English worldwide, and by doing so, increase Westernization. At the same time, it will increase pushback

against perceptions of Westernization, and will make it easier for groups opposed to homogenization to communicate. The influence of the Internet in the Arab Spring (although ultimately unsuccessful) is the harbinger of the future. Countries that cut themselves off (e.g., Cuba, North Korea) or significantly limit speech (e.g., China) will risk putting themselves at significant economic disadvantage. On the other hand, necessity is the mother of invention, and such countries will find significant innovation among their populations to getting around controls. If that innovation can be harnessed, it may help them in the long run.”

Anonymously, a federal government employee responded, “The Internet has the potential to significantly change how the government operates, to include greater citizen involvement in the process of making rules and laws. It can change how government services are delivered.”

Anonymously, a professor of communication and author of studies of Internet culture said he thinks new tools and approaches may possibly empower more effective public uprisings. “We will see more and more examples where grassroots networks will seek to challenge, reform, or overturn established authorities in their countries, similar to what we’ve seen with the Arab Spring, with Turkey and Brazil this past year, and with the Dreamers and Occupy movements in the United States,” he wrote. “The issue of how responsive elite groups will be to these challenges will come to a head as we develop more sophisticated models for turning voice into influence and for disrupting established institutions.”

There are those who expect progress to be made, but not everywhere. **Olivier Crepin-Leblond**, managing director of Global Information Highway Ltd. in London, UK, wrote, “The biggest impact of the Internet will be on freedom. In some countries, it will enable freedom. In others, it will kill it by being used as a tool to brainwash populations.”

6) The spread of the ‘Ubernet’ will diminish the meaning of borders, and new ‘nations’ of those with shared interests may emerge online and exist beyond the capacity of current nation-states to control.

Since the first years of its popularization, the Internet has been seen as a tool that is capable of removing people’s geographic location from the equation of successful information exchange. Many survey respondents predict this idea to extend by 2025 to a change in how people see where they “live.”

Anonymously, a research scientist based in California wrote, “The Internet will facilitate the formation of a global culture, with elements of all the world’s cultures participating.”

David Hughes, an Internet pioneer, who from 1972 worked in individual to/from digital telecommunications, responded, "All 7-plus billion humans on this planet will sooner or later be 'connected' to each other and fixed destinations, via the Uber(not inter)Net. That *can* lead to the diminished power over people's lives within nation-states. When every person on this planet can reach, and communicate two-way, with every other person on this planet, the power of nation-states to control every human inside its geographic boundaries may start to diminish. Being replaced — over another 50 or more years — by self-organizing, trans-border people-groups. Nations will still have military and police forces, but increasingly these will become less capable of controlling populations. This assumes, of course, that no entity will detonate large nuclear devices capable of destroying large populations or cause global deadly irradiation."

Anonymously, a leading editor of communication technology textbooks wrote, "There will be widespread grassroots warfare with social control institutions. Advances in technology will make this resistance more effective. As control organizations improve their methods, ways around them will continue to be developed by the activist segment of the population."

JP Rangaswami, chief scientist for Salesforce.com, observed, "The problems that humanity now faces are problems that can't be contained by political borders or economic systems. Traditional structures of government and governance are therefore ill-equipped to create the sensors, the flows, the ability to recognise patterns, the ability to identify root causes, the ability to act on the insights gained, the ability to do any or all of this at speed, while working collaboratively across borders and time zones and sociopolitical systems and cultures. From climate change to disease control, from water conservation to nutrition, from the resolution of immune-system-weakness conditions to solving the growing obesity problem, the answer lies in what the Internet will be in decades to come. By 2025, we will have a good idea of its foundations. Society as a whole, in government, in the public sector, in the private sector, in the voluntary sector, in academia, in NGOs, and as the common man and woman, will come to recognise that behind the Internet is a connected world of *people*. People who route round obstacles to solve problems in ways that people could not before. With that realisation, we will see people elect to solve problems that have hitherto been the domain of interminable conferences and committees who, for no fault of their own bar their very architecture, could not make any real impact."

Manuel Landa, CEO of Urban360, a Mexican startup, responded, "By 2025, people will not think about political borders or cultural differences as we do now. The Internet would have erased those concepts by then."

Anonymously, a designer, writer, and Web developer wrote, "Countries with borders will be less important or may cease to exist as anything more than infrastructure providers."

Anonymously, an information science professional wrote, "Borders could fall; more people will be able to be engaged and contribute to the world."

Frank Feather, CEO and chief trend tracker for Future-Trends.com, wrote, "The biggest impact will be full digitization of every aspect of our lives, of society, of commerce, and of politics and geopolitics... Digitization will permit democratization across boundaries and cultures and political systems in very significant ways. It is inevitable because digitization is a force in motion that cannot be stopped, and its benefits will daily become more manifest, leading to a rapid speed up."

Anonymously, a panelist on the futurism project called Survey 2050 predicted, "The future will be virtual reality. When new battlegrounds emerge, old borders lose significance. We may be united where we were divided, and divided where we were one."

7) The Internet will become 'the Internets,' as access, systems, and principles are renegotiated.

Some big thinkers' visions of 2025 expand beyond the status quo in regard to the systems and principles of human interaction.

Glenn Grossman, a consultant to a software provider, said, "In 2025, we may not even call it the Internet. The idea of data sharing via other mediums will be likely. We still use the IP-based model for the Internet. This might not be the case in 2025. So, we will see more interconnected elements, and people will just assume it. Convergence of information and every nation will feel a bit closer. So, our economies will be more tied together, and thus, we can see big political changes. It will continue to improve the lives of people via sharing information, commerce, and education."

Anonymously, the executive director of a futures coalition responded, "Even the most willing participants in technology may not comprehend the full meaning and scope of a shift as it is occurring. Our inability to grasp the significance of these developments hampers our abilities through policy and practice to mitigate the worst effects of disruption while missing the true opportunities for human development and social betterment that may be aided by these shifts... the hybrid information commons/commercial zone that is the Internet is not sustainable as we know it, and therefore destined to change. Whether it's towards a more locked-down corporate/security panopticon or an asymmetric ecosystem, where digital freedoms depend on where the user is based, remains to be seen."

Anonymously, a technical consultant for local and wide area networking wrote, "Rather than phone companies, cable companies, satellite companies, and such providing access to the Internet, the Internet will be the infrastructure that current 'providers' will hang onto."

Anonymously, an information science professional wrote, “We have a golden opportunity to increase our capabilities to be creative, develop our natural personal capabilities, and enhance human relationships. Any improvement should genuinely increase these without detriment to person-to-person contact and our ability to communicate our thoughts.”

Steffen Schilke, a research scientist who works for a government in Europe, predicted, “There will be no Internet anymore as we know it as of today — it will be woven right into everything, like the air and the gravity surrounding us, not distinguishable from the environment — always there and always on if you want it to be there... As I said, there will be no more Internet; it will be more like a Borg conglomerate on a voluntary and (hopefully) free basis.”

Jim Leonick, director of new product development for Ipsos, responded, “Technology will inevitably be integrated into the human body/mind in ways we cannot fathom today.”

Rex Troumbley, a researcher at the Hawaii Research Center for Futures Studies, wrote, “Attention should be focused on what comes after the Internet rather than projecting the current iteration (even if slightly improved) into the future. The greatest impact of the Internet between now and 2025 will be its displacement, either by new technologies or by new policies, and its dispersion into multiple Internets.”

8) An Internet-enabled revolution in education will spread more opportunities, with less money spent on real estate and teachers.

The ability to access and share knowledge in many forms with billions of people globally is at the top of the list for many survey respondents. Some experts expect the evolution of online tools to expand the ways in which a formal education can be delivered, disrupting the status quo.

Adrian Schofield, manager of applied research for the Johannesburg Centre for Software Engineering, wrote, “The Internet will be the core means of creating, analysing, storing, and sharing information in any form that can be digitised... Learning will no longer be dependent on the quality of parents and teachers in person. Scholars and students will have access to the best materials and content available globally.”

Anonymously, an executive for national news organization wrote, “Artificial intelligence will be much more ubiquitous... Higher education will be transformed, with virtual classrooms becoming much more common and replacing some in-classroom instruction. This technology — along with demographic and economic trends — will result in a significant number of private universities collapsing and will lead to historic changes in the business model of public higher education.”

Alex Halavais, an associate professor of social and behavioral sciences at Arizona State University, predicted, “I suspect we will start to see some really extraordinary changes in the way people learn over the next decade that will continue beyond that. Especially in higher education, the current institutional structures are at a breaking point. The Internet is both a large part of the problem and a part of the solution. Already, it is possible to learn in new ways using network resources, and this will continue. The larger change will be in the ways in which this learning is measured and communicated. As the diploma (high school and college) is joined by other forms of accepted credentials, traditional institutions of education will be joined by a range of alternatives. Like other institutions, the degree to which they can support and interact with these new alternatives, rather than compete with them, will determine their success.”

Anonymously, a respondent based in the US predicted, “All public education will be by master teachers who connect through the Internet to all students across the country — local teachers will become tutors only.”

Tapio Varis, chair in global e-learning for UNESCO, wrote, “The future will bring a creation of global knowledge centres for the benefit of global development and regional and local services in education, healthcare and business. There will be an implementation of a global university system, utilizing broadband Internet and creating global knowledge centres for multiple services.”

Anonymously, an information resources worker for a small private college wrote, “More and more students will do their lessons and work asynchronously. Those who are unable to self-discipline will be left behind, unfortunately. Hopefully, the lesson types will also diversify to embrace all kinds of learning (kinetic, visual, etc.).”

Peter S. Vogel, Internet law expert and blogger at Gardere Wynne Sewell LLP, noted, “The greatest social change between now and 2025 will be to raise the educational standards for people regardless of their locale. The Internet has already proven to be a great educational tool, and such wonderful bodies information such as Wikipedia allows individuals to share their collective wisdom with other people. Also the increased use of Massive Open Online Courses will allow brilliant educators to share their messages to global audiences.”

Anonymously, a usability engineer responded, “There will be an investment in technology that will eventually reduce costs and improve public education. There will be less money spent on real estate and teacher salaries. This advance in online education will also hopefully reduce the education gaps based on income levels.”

Brough Turner, founder and CTO of netBlazr Inc., wrote, “It seems clear education is ripe for revolution and the Internet makes that possible, even inevitable. Giving 7-plus billion people

access to information and education on any and all possible topics will trigger the biggest revolution since the Renaissance.”

Anonymously, one expert predicted that while literacy rates will be raised by bringing more people Internet access it is possible that some will primarily learn through only the visual resources available online.

Karen Besprovan, research and analytics director for Omnicommedia Group, predicted, “The big evolution will be in the overall impact of real-time, the immediacy of everything, the reality show of everything, the biggest library of everything. It will be the central point, for either construction, evolution of life, or destruction, as you can learn what you need from there... E-learning will be important, and the Internet will close the gap between rich and poor through access to education and knowledge. There may be no more need for some people to know how to write and read. Through YouTube and the video culture, everybody will have the opportunity to learn.”

There was an expression of frustration with the slow evolution of education in the United States by a few survey respondents.

Celia Pearce, an associate professor of digital media at the Georgia Institute of Technology, wrote, “The government will spy on us while failing to protect us from corporations. Cyber bullying and hate speech will continue to grow unfettered. The US education system will continue to decline; as a result, we will continue to see a poor match in labor demands and labor pool, along with a continued growth of economic disparity in this country, as well as outsourcing to tech-related jobs abroad.”

Joan Neslund, an information resources professional, agreed, writing, “Education will totally change with global classrooms. The United States will no longer rule the world; we will have a difficult time keeping our heads above water. Corporate greed has killed us. Students won't think about the technology behind what they do; they will focus on the methods and collaboration that will happen. The United States will take a backseat to other countries. Poor education models, poverty, and corporate greed have knocked us back, and it will take three generations or so to come back if at all.”

One survey respondent disagreed with those most enthusiastic about advances in education by 2025. **Justin Reich**, a fellow at Harvard University's Berkman Center for Internet & Society, predicted, “The transformation of the educational sector will prove far, far overblown. Especially in the K-12 system, schools in 2025 will look an awful lot like schools in 2013.”

The Less-Hopeful Theses

9) Dangerous divides between haves and have-nots may expand, resulting in resentment and possible violence.

Many expert respondents used the terms “gap,” “haves and have-nots,” and “divides” while describing concerns about the impact of the Internet by 2025. Some said Internet access is a basic need that should be considered to be a human right.

Pietro Ciminelli, director of finance for BOCES, wrote, “Significant numbers of people will become structurally unemployed because they were unwilling to keep up their skills with the changing technology or unwilling to accept the changing technology. The Internet will be the primary communication device for society. The biggest concern is if it will increase the divide between the wealthy and the poor.”

Anonymously, a professor at the University of California who teaches in a discipline that combines ICT with social sciences responded, “Among the elite, identification with nations, nationalities, and ethnicities will disappear. Their identification will be with this international elite and with the companies through which they build wealth. Already, people in a certain stratum move around and live all over the world, enabled, to a large degree, by the Internet. The educated, capable, innovative populations from which local and national leaders have traditionally been drawn will be less involved with geographically-oriented communities and institutions — to the detriment of those communities and institutions. This will increase disparities between developed nations and others and between underprivileged local areas, such as between the wealthy urban areas and poorer communities. There will be people who are concerned with the civic sphere, but fewer and fewer of those will be from the better-educated and most accomplished ranks. The less-well-resourced countries will be markets for the other countries' companies — i.e., the way companies now are selling information technologies in the third world. This trend will accelerate — fewer in-country entrepreneurs and fewer educated and capable people from third-world countries will stay there and try to address their countries' needs.”

Anonymously, the director of operations for MetaFilter.com wrote, “The Internet will help the rich get richer and become a tool to further marginalize people who are already living with poverty, mental illness, and other serious challenges.”

George Lessard, information curator and media specialist for MediaMentor, wrote, “The most significant impact of the Internet is its impact on the dissemination of knowledge and information. We have only seen the smallest real impact of this process. It is greater than the invention of the university, the printing press, and the electronic media. The battle between those who wish to

control it and those who wish to have it as open as possible has only just begun and will intensify for many years. The only way that the Internet can continue to have an ongoing and significant impact is if there is a worldwide recognition of the individual's access to and use of the Internet as part of one's basic human right to communicate. Access to and use of the Internet as a basic human right (or not) will be the biggest change to human society."

Top communications researcher **Oscar Gandy**, an emeritus professor at the Annenberg School of the University of Pennsylvania, said inequality is being amplified, and he predicted hostility due to divides could lead to "great and lasting harm" writing, "I have taken note of the rather dramatic changes in the levels of inequality within and between nations. It seems likely to me that the benefits and harms that will be generated in part as a function of changes in the network and the systems connected through it are likely to be maldistributed. The anger, hostility, and resentment that will be generated in response to this inequality seem likely to be expressed in ways that will cause great and lasting harm. We have to think seriously about the kinds of conflicts that will arise in response to the growing inequality enabled and amplified by means of networked transactions that benefit smaller and smaller segments of the global population. Social media will facilitate and amplify the feelings of loss and abuse. They will also facilitate the sharing of examples and instructions about how to challenge, resist, and/or punish what will increasingly come to be seen as unjust. The network infrastructure and key service providers are likely to become targets of actions meant to punish this misbehavior."

Sophia Bekele of DotConnectAfrica responded, "The Internet is self-generating as well as rejuvenating. Its increasing importance in daily interactions makes it close to a basic need. It has shifted to being an enabling platform where everything else thrives. Academia, commerce, health, science, and all other facets are continually dependent on this resource. Issues and concerns that have to now be properly governed include privacy, digital gap reduction, green technology, digital waste management, and data proliferation."

Mike Osswald, a futurist at Hanson Inc., made the case, "The rapid pace of technological change will only hurt the poor and lower-middle class (and third-world and mass-labor markets) who will not be able to benefit fully from the improvements, and will only continue to be displaced by technical/robotic solutions that limit their ability to earn a living and provide for their families. To this extent, technology will make society as a whole worse than in the past."

Still, others said that if the capacity to use online tools can be extended globally it can help facilitate progress toward peace.

Vytautas Butrimas, a chief adviser for a government ministry with 23 years of experience in ICTs and defense policy, responded, "A great impact will be the decline of 'fundamentalism.' Many

irrational/extremist beliefs will be openly discredited as the ability of people to find information and evaluate these beliefs increases. One caveat: education needs to be improved. People cannot be brought up to be just consumers of content. People with critical thinking skills who can make rational judgments based on that information and learn to pick out the pearls from the pebbles are key to fulfilling the promise of the Internet. The Internet is a tool to be used in fostering and preserving respect for human rights and promoting democratic processes. Tools are needed to govern a peaceful progression toward a higher level of civilization."

While many expressed fears over gaps, there were some survey respondents who said Internet-enabled tools will close them. **Susan Brudvig**, a professor at Indiana University East, wrote, "The digital divide between people in more developed nation-states and lesser developed nation-states will be non-existent, or at a minimum, non-consequential."

Nick Wreden of the University of Technology in Kuala Lumpur, wrote, "Wireless broadband and computing capabilities will be available to even the poorest and most remote regions of the world. Imagine the collective intelligence locked up in the minds of the rural poor. Providing them the tools for creativity, collaboration, and learning will produce significant benefits."

10) Abuses and abusers will 'evolve and scale.' Human nature isn't changing; there's laziness, bullying, stalking, stupidity, pornography, dirty tricks, crime, and those who practice them have new capacity to make life miserable for others.

For these respondents, trust is the largest issue when it comes to trying to create a complete system of global connectivity. Humans have wreaked havoc upon one another or let each other down in one way or another consistently over time in the communities they have created, and the online community is no different. Terrorists, criminals, bullies, liars, tricksters, pornographers, sadists, misanthropes, and other bad actors are enabled by the Internet, and it seems that being online augments humans' tendencies toward all of the "seven deadly sins": envy, gluttony, greed, lust, pride, sloth, and wrath.

Many survey respondents chose to express their dismay and concern with people's negative behaviors online, and they said these negatives will have the most impact by 2025.

Stewart Baker, a partner at Steptoe & Johnson, a Washington law firm, wrote, "In the long run, criminal activity will swamp us if we do not find a better way to identify and then punish antisocial action on the Internet. The Chinese will realize this first, because doing so does not challenge their ideology the way it challenges ours. But some time close to 2025, we'll give up on anonymity and begin building attribution into the fabric of the Web."

Valerie Bock, technical services lead for Q2 Learning, LLC, wrote, "Information tech enables all kinds of wonderful things, but it is only used within the context of human nature, which doesn't seem to be changing all that quickly!"

K.G. Schneider, university librarian and blogger, focused her answer on her concerns about the possibility of human detachment, "As technology continues to permeate our lives in the context of growing environmental disasters and climate change, we may be vulnerable to creating barriers of consciousness to the larger world around us. There is much great potential in technology, but the tale of the Good Samaritan reminds us of the need for those of us with access to the best technology to be fully awake to the plight of others and fully aware of what is happening to what one prayer book calls "this fragile earth, our island home."

A large number of survey respondents preferred to **remain anonymous** when they answered this question. They evidently preferred not to take public credit for their expression of doubts about humanity.

An employee of the US government based in Washington, DC, said, "The Internet has brought out the vanity and narcissism of humanity in an unprecedented way. That will only continue and will be the biggest social impact."

A leader of Pro6 Networks in India wrote, "Too much adult content will be flooding around, cyber-bullying will rise, cyber-stalking will rise, and child pornography might increase if not controlled."

Another respondent wrote, "I'm very concerned about the increasing isolation and the resulting lack of meaningful and courteous human interactions."

A community information resources manager wrote, "I expect the world to grow smaller and more tightly knit via the Internet, but humankind can be very willfully divisive and aggressive, so I don't know if it will be enough to offset that stupidity that we too often indulge in."

The tendencies for people to accept the first answer they find online and believe it or to only seek out the ideas of those who are of like mind is seen as a looming danger. A post-doc researcher in mechanical engineering responded, "The Internet makes it so much easier to spread lies and disinformation, as well as information. If people don't have the skills to question and understand the motives of their sources, then the Internet could be in a position to do some serious damage."

An information science professional wrote, "There will still be a problem with people finding misinformation and assuming that it is true, and then acting on that misinformation. While the Internet can foster international connections, the world will continue to splinter, with most people only seeking and finding what confirms their own views."

A multiscreen (mobile + PC) shopper analyst for eBay wrote, "I don't know that having 120,000 sources of information makes you any better informed than having one source of info. The ability to build a case based on what you find — which may be erroneous or slanted or incomplete — may do more to polarize people than the help it provides... Responsible use of information is going to be the biggest challenge."

A technology developer and administrator wrote, "There will be more loss of privacy, more regulation, less face-to-face social communication, loss of local or geographical identity, and an onslaught of ignorance from being misinformed or believing what is being flashed to us from who knows where."

A fund-raiser and webmaster for a public non-profit organization responded, "I am concerned about the level of incivility and violence that seems to be increasing on social media. I hope the social side of the Internet does not devolve into a virtual mob activity."

A PhD who participates in civil society efforts to advance information and communication technologies for social development and democracy said, "We are able to develop technology but not justice, equality, and freedom. I am afraid the more advanced ICT of 2025 will not make the human being a better being."

Some respondents noted that there are negatives but they retain hope for the best. An information-resources professional in a small Midwestern town wrote, "Mass group communication, easier and cheaper ways to interact, and a society that is becoming wise to the new technology will bring about a renaissance of thought. People will find others who think like them faster and they will be more able to work together. The evolution of a stable society will speed up. It may look a little rocky now, but new ways to have discourse with many voices will be the saving grace."

A community information resources manager wrote, "I expect the world to grow smaller and more tightly knit via the Internet, but humankind can be very willfully divisive and aggressive, so I don't know if it will be enough to offset that stupidity that we too often indulge in. I want to have faith in Gene Roddenberry's vision of mankind's future of cooperation and scientific advancement, but it can be difficult to keep that faith on a worldwide scale."

John Saguto, an executive decision support analyst in the implementation of geospatial information systems for disaster response, also combined both positives and negatives, writing, "Truth and accuracy will be the challenge. The bad impacts include purposeful misinformation and nanosecond attention spans. Immediate satisfaction and ADD-type mentalities will be accepted as being normal. We will see mental illness from overwhelming information access, as well as

degenerative body fitness. As our minds expand, our bodies and 'stress' seem to increase as well. Lethargic lifestyles are becoming socially 'understood.' *If* we are able to better communicate internationally, our 'local village' heritage will be replaced with massive media dilution of concerns that might otherwise cause a call-to-action. The good impacts include rapidly expanding international communications that will permit a much better understanding of global issues. Positive trends are crowdsourcing and peer-level discussions for truth. There is a desperate need for critical thinkers to help filter out the white noise. Immediate gratification will become normal. Creativity will expand, and the golden age of communications will flourish!"

A professor from The New School in New York wrote, "The thing to do is go out after finishing this survey and use the Internet to make a change, perhaps starting with yourself. I'll do this by re-reading *The Brothers Karamazov*, and the wisdom of Father Zosima, starting with: 'Each one of us is guilty before everybody for everything, and I am more guilty than anybody else,' and moving on to, 'Everything is good and magnificent, because everything is true.'"

A self-described geek with decades of survey research experience predicted, "People will return to keeping handwritten journals on acid-free paper, writing poetry, composing songs, playing parlor music, gardening, and knitting. Or, they will be locked in La-Z-Boy loungers on life support, streaming movies directly to a chip in their head."

Doc Searls, journalist and director of ProjectVRM at Harvard University's Berkman Center for Internet and Society, author of *The Intention Economy: When Customers Take Charge* and co-author of *The Cluetrain Manifesto*, said all of this is survivable. "It is impossible to overstate the influence of the Internet on all it connects, including people, companies, governments, institutions and things, because it is now a prevailing condition of our existence on the planet. Everything that depends on communication now must adapt to the fact of the Internet in its midst. Same goes for every person, company, government, institution and thing that depends on connected technology. Of course, there will be bad acting by some, taking advantage of organizational vulnerabilities and gaming systems in other ways. Organizations in the meantime will continue rationalizing negative externalities, such as we see today with pollution of the Internet's pathways by boundless wasted advertising messages, and bots working to game the same business. But, as Clay Shirky says, the sign of a good idea is that it's easy to imagine bad uses of it. Civilization deals with bad acting through development of manners, norms, laws and regulations. Expect all of those to emerge and evolve over the coming years. But don't expect the Internet to go away. It won't, and it can't, any more than language, mathematics, art, and music will go away... Will the Internet make it possible for our entire civilization to collapse together, in one big awful heap? Possibly. But the Internet has already made it possible for us to use one of our unique graces — the ability to share knowledge —

for good, and to a degree never before possible. I'm inclined to bet on the former and hope for the latter. I expect we'll get both in the long run."

11) Pressured by these changes, governments and corporations will try to assert power — and at times succeed — as they invoke security and cultural norms.

A recurring theme found in the Future of the Internet surveys over the past decade is the concern that leaders serving government or corporate interests will not make decisions that serve the global public good. As the exchange of most information, goods, and services has moved online, as some political entities see the Internet as a threat to their survival, as the power of Internet-enabled corporate giants such as Google and Amazon continues to be magnified, concerns over security and trust have arisen, regulation of online interaction has begun to emerge and a battle for control is being waged.

Anonymously, a self-employed writer and editor responded, "The Internet will be everywhere by 2025 — the question is, who will control it, and for what end?"

Barbara Simons, a former president of the Association of Computing Machinery who worked at IBM and is currently board chair for Verified Voting, wrote, "The question is, first, will the same open access to information still exist in 2025 and, second, to what kind of surveillance will Internet users be subjected? It's difficult to know how the Internet will develop, now that aspects of it have become significantly politicized. I suspect that policy decisions will have at least as much impact on the development of the Internet as technology."

Some of the survey respondents say they believe the Internet has already been transformed or fragmented by the battle for control or at least it will be by 2025.

Anonymously, a retired engineer and IETF participant responded, "The Internet is just a tool. By 2025, it will have become even more of a Rube Goldberg creation than it already is, and while it will probably be the technology of the masses, the technological visionaries will have moved on to something else. Governments will no longer pretend that their massive and targeted surveillance efforts are covert. Controlling access to the Internet will become a means of social control, just as controlling access to transportation is today."

Glenn Edens, research scientist at PARC and the IETF area chair in networking, distributed systems and security, wrote, "We have many opportunities to solve significant problems of education, health care, democracy, and promoting freedom throughout the world. At the same time, the Internet is fragmenting into many 'private Internets' with different policies and business motivations. It could go either way at this point."

Richard Forno, director of the UMBC Graduate Cybersecurity Program and affiliate at Stanford Law School's Center for Internet and Society, wrote, "I do worry that increasing concern about Internet control, privacy, and surveillance may lead to the much-feared 'Balkanization' of the Internet along regional or national boundaries, thus fracturing the global Internet and its benefits, thereby making it *easier* for information and interaction to be censored, constrained, or controlled by the traditional centers of social authority."

Anonymously, one respondent predicted the rise of police states, writing, "The Pandora's Box has been opened, and there is not much we can do to stop the stream of private information pouring in the public online venues. The biggest change will be dystopia-like changes for freedom around the world. I forecast the rise of police states in many parts of the world. If the NSA can do it now, then China/North Korea/Saudi Arabia will be able to do it in a decade, and those governments will not restrain themselves."

One reason cited for the likelihood of more government control is the expectation of heightened future security threats and the need for a trusted system of exchange of ideas and commerce. As this happens, one expert says, a reduced level of privacy and security is likely on the global Internet.

Alan Clark, CEO of a software technology company, and active participant in Internet standards development, responded, "There is increased interest in government's use of the Internet to monitor citizens — the NSA is the most expert but far from being the most aggressive in this area. There have been moves within the UN's International Telecommunications Union to try to wrest control of the Internet away from the US, and to foster the development of technology such as DPI [deep packet inspection] that can be used to monitor usage. It is likely that more people will be disadvantaged (arrested, compromised, blackmailed) due to the authorized and unauthorized use of monitored activity data. There will be a large increase in the degree to which things are networked and Internet accessible, however no improvement in people's awareness of Internet security, which means that hackers will be able to do more damage to more people and services. I'd like to say something positive, however I am concerned that the greatest impact areas will be a reduced level of privacy and security."

Anonymously, a social entrepreneur dedicated to increasing online opportunities responded, "The Internet will be an instrument of control rather than liberation. This is not a technical inevitability, it is just a consequence of choices being made today and trends that are already quite self-evident. There is little that the average citizen can do against the government-corporate alliance; one which results from short-term self-interest rather than any type of widespread conspiracy."

Anonymously, a researcher wrote, “The future prospects are a bad impact on humanity and a good impact on large corporations that control humanity.”

Anonymously, a researcher and associate professor at the University of Illinois responded, “The greatest impact of the Internet is already well underway. Individuals are increasingly under surveillance by a variety of agents, both governmental and corporate, for a variety of reasons. Shoshana Zuboff pointed out long ago that making processes subject to information technology's ability to control and monitor inevitably led to people in positions of power trying to exploit that new information obtained by those technologies to further control employees responsible for those processes. People's lives are increasingly 'informatized,' and the information about their lives increasingly available to a variety of government and corporate players, from Amazon buying patterns to Facebook social network graphs to tracking cookies employed by a variety of agencies. Trying to find new ways to exploit that information to control consumer and citizen behavior will be a key goal for government and corporate agencies for the next decade.”

Anonymously, one survey participant said we are “killing the goose that laid the golden eggs.”

Anonymously, a professor at Swarthmore College noted, “The biggest mistake we continue to make is to think that the Internet's possibilities and problems are caused by its underlying technologies. Everything good and bad that can happen in the next decade with digital tools and online media is a function of the legal, political, and economic environment as a whole. We are on the verge of killing the goose that laid the golden eggs by allowing essentially selfish and/or authoritarian interests to capture what has been a vibrant commons. Once the Internet is enclosed, most of what has made it valuable and vibrant will disappear. That's the precipice upon which the digital future now lies precariously balanced.”

Power in the hands of “the people” isn't seen by all survey respondents as being an improvement over the status quo. **Anonymously**, the CEO and general manager for a large US public broadcasting organization responded, “Hierarchies will be upended, and power will be more widely distributed, with sweeping impacts. Accountability will not necessarily follow the distribution of power.”

Some survey respondents said they fear that all of this will lead to people being manipulated and controlled online. The abuse of access to private information is often cited as of great concern.

Anonymously, a compliance officer for a non-profit social services provider wrote, “Our total loss of control over our information and how it's used will eventually change us. There's no reason to believe that people's interests will be protected. As older people who understand the ramifications of this loss of control die out, younger people who have grown used to it will be OK

with it. I don't understand the total implications of our total loss of privacy but I do understand that it won't be a positive. The less we control about ourselves the more open we are to manipulation. Masses of people who can be manipulated by any power can be coerced into nearly anything, and throughout history, that kind of social control usually did not bode well."

Some said these concerns will stifle the potential of the Internet by 2025.

Anonymously, an information resources professional observed, "While the Internet will continue to have a significant role in our lives, corporate attempts to profit from the Internet, fears of privacy, and fears of the misuse of personal information will reduce the role of the Internet in our lives by 2025."

Anoop Ghanwani, a distinguished engineer at Dell, said, "Regulation will always stand in the way of anything significant happening."

Marsali Hancock, president and CEO of the Internet Keep Safe Coalition, wrote, "The losses will be when governments, organizations, or malicious individuals use the Internet with the intent to harm or to restrict rights or opportunities from individuals or groups of populations."

Some survey respondents said they expect some sort of regulatory relief will be found for threats to privacy.

Anonymously, a quality analyst for Google responded, "Privacy issues will continue to nag us, as it will take decades for legal structures to adapt to a world where privacy could no longer exist," adding tongue-in-cheek, "but hopefully sex won't change too much."

There are those who say they believe that making knowledge accessible and processes transparent might tip the balance further toward the rights of the individual over those of the hierarchical human organizations of the past, however.

William Schrader, co-founder and CEO of PSINet, the first commercial ISP, said, "The Internet will help everyone understand, without government or the wealthy interfering with transmission, the challenges facing mankind... The problem in times before the Internet was the government could easily manipulate the news that went out to its population — lies and secrets. Now, the Internet tells everything about the government's manipulations, even if it is considered illegal to do so (witness Edward Snowden's actions)... Governments' attempt to isolate themselves and their populations from the influence of global economic impact will be stopped by the Internet."

Jim Harper, director of information policy studies for The Cato Institute, responded, "Though the last two decades provide contrary evidence, I still believe the Internet will revitalize

democracy. More and more, governments will take their place as servants of the people, and the people will take their place as overseers of government. Right now, it's the other way around, and that's very bad."

12) People will continue — sometimes grudgingly — to make tradeoffs favoring convenience and perceived immediate gains over privacy; and privacy will be something only the upscale will enjoy.

Every technology from the discovery of fire and the wheel has resulted in both positive and negative social, political and economic impacts. **Anonymously**, a professional who works for a consulting firm rounded up some of the likely plus and minus results between now and 2025: "Cons include: the loss of privacy — you may be tracked/watched/recorded without you even knowing it; people being connected all the time in the sense that you don't/won't know how it used to like to be disconnected; people lacking critical thinking and information literacy skills and being unable to manage their digital identities; new illnesses based on anxiety, stress and being connected all the time. Pros include: less time between purchasing something online and having it delivered — i.e., drones or other methods; maybe more safety — for example, criminals also will be easier to find as the connected world becomes smaller, and maybe we will be able to predict some crimes; interfaces will be transparent — i.e., activated by body movements, etc.; machines will predict what you will need next — i.e., your vacation is near in your calendar so you get travel suggestions; people networking across the globe; information is free (open-access), so science and research moves at a faster pace; the Semantic Web improves capabilities."

A number of survey respondents said most of the Internet public will mindlessly exchange their personal information or future freedom in some regard for something they find attractive to their interests in the near term.

Paul Babbitt, an associate professor at Southern Arkansas University, predicted, "Though there will be plenty of 'free' Internet, it will usually be of dubious quality. Another possibility is that areas of the Internet will be free but access will be restricted and participation will be monitored. Governments will become much more effective in using the Internet as an instrument of political and social control. That is, filters will be increasingly valuable and important, and effective and useful filters will be able to charge for their services. People will be more than happy to trade the free-wheeling aspect common to many Internet sites for more structured and regulated environments."

Anonymously, a program manager in a research center for a private university predicted, "The most significant impact will be the lifting of the veil on government reconnaissance, and the

general reluctant acceptance by the general population of this lack of privacy will affect democracy as we know it.”

Anonymously, one respondent wrote, “Yes, the information we want will increasingly find its way to us, as networks learn to accurately predict our interests and weaknesses. But that will also tempt us to stop seeking out knowledge, narrowing our horizons, even as we delve evermore deep. The privacy premium may also be a factor: only the relatively well-off (and well-educated) will know how to preserve their privacy in 2025.”

Anonymously, a research scientist and educator from Oxford, England, wrote, “There will be a potential erosion of freedom of expression online as policy is oriented to protecting security, privacy, and other values.”

Anonymously, the managing director of a global advertising network observed, “Connectivity will reduce privacy and trade technology dependence for convenience. Overall, the impact will be positive, though access will raise expectations and demands for people in developing nations and add pressure on first-world countries to share or redistribute more of the wealth.”

Will making tradeoffs for convenience lead to mind control? One respondent says yes.

Mikey O'Connor, an elected representative to ICANN’s GNSO Council, representing the ISP and Connectivity Provider Constituency, wrote, “The Internet will be used as the most effective force of mind control the planet has ever seen, leaving the Madison Avenue revolution as a piddling, small thing by comparison.”

One respondent argued that the Internet’s main guardians treat it as “an agent of the commercialization of life.” **Jonathan Sterne**, a professor in the department of art history and communication studies at McGill University, wrote, “Right now, it is headed toward a highly commercialized, profit-driven, opaque and privatized domain, much like the mass media of the 1980s that net boosters of the 1990s claimed to displace. Its main guardians seem to treat it as an agent of the commercialization of life, and other benefits are at best seen as side effects. The best possible outcome for the Internet would be if its major functions came to be understood as public utilities like water or power, or better, as resources, like clean air. If this were the case, companies would have much more real and material responsibilities to their users, and commercial uses wouldn’t necessarily be privileged over all others. Free public broadband; strong international non-corporate governance; cheap, forward-compatible devices rather than disposable consumer electronics; data-use transparency; and high levels of hackability and interoperability would all need to subtend such an arrangement for the Internet to play any meaningful role in real social, political, economic or environmental progress. Examples of progress include: reduced poverty,

illness and hunger; accountable representative governments; slowing down environmental catastrophe; greater range of life chances for people that are not determined by the circumstances of their birth; greater equality across social differences; flourishing cultural diversity and access to different points of view and cultural practices; better public support for education and the arts; greater life-expectancy and quality of life; fewer working hours and higher real average income for households; higher happiness indices. All of these are measurable outcomes."

13) Humans and their current organizations may not respond quickly enough to challenges presented by complex networks.

A librarian shared a quote from Albert Einstein: "It has become appallingly clear that our technology has surpassed our humanity." Many other survey respondents agreed. Some experts say human responses to the swiftly changing information environment have not adjusted to keep up with the evolving paradigm. They say there's serious work to be done.

Lee McKnight, a professor of entrepreneurship and innovation at the iSchool at Syracuse University, wrote, "I expect there will be some collective mental breakthrough as the public begins to understand that we are all part of a dynamic digital ecosystem. There will be discomfort and anxiety about the 'Borg' or machines taking over, or the realization that you should be paranoid, because everything you do and touch and say — in viewing and listening range of a thing or device — can/is being monitored... When there will be an abortive 'war against the machines' or a new social movement for off-grid living, I can't see precisely in my crystal ball, but looks like 2020 is a safe bet to be a time when counter-forces could be pushing back against the smart machines. Especially if economic cycles and technical change lead to labor force disruptions and further social spreads between the information-rich, the really-rich, and those divided from all that except from what they see in their minds (assuming very embedded systems)."

Evan Michelson, a researcher exploring the societal and policy implications of emerging technologies, predicted, "The biggest impact of the Internet is that will no longer allow for reasoned consideration of complex social challenges. What the Internet will do is make it more difficult to contemplate the longer-term implications of decisions made today. The future will, unfortunately, suffer in service of the present."

Anonymously, a professional who carries out research and development for a major software company noted, "Organized crime is only now waking up to the opportunity to use the Internet for systemic fraud. Defenses are not rising fast enough."

Ian O'Byrne, an assistant professor at the University of New Haven, wrote, "Wearables, robotics, AI, and the Internet of Things have the potential to significantly advance our notions about

literacy, communication, and socialization. The challenge is with personal social norms, and legislative bodies to keep up.”

Ed Lyell, a professor of business and economics and technology consultant, said, “Direct democracy has the potential to overcome the oppressive gridlock of US government. A congress and local governments controlled by the rich and powerful have made representative government a negative force. Corporations have become more powerful than government at all levels. They focus on their own profit-making objectives and have managed to reduce or eliminate government oversight that used to limit their ability to exploit consumers, employees, and others. We are in a lose-lose game that is driving all business to exploitation of the masses for the gain of the few. Perhaps individuals linked up to one another will create the countervailing force necessary to fix this. Linking more people, beyond boundaries of geography, age, religion and skill sets has the potential to enhance the quality of life for the masses. Historically, the control of information has always empowered only those at the top. Perhaps we can reverse this with people-to-people connections, as the Arab Spring demonstrated when people could work around negative governments.”

Raymond Plzak, former CEO of the American Registry for Internet Numbers, and current member of the Board of Directors of the Internet Corporation for Assigned Names and Numbers, explained, “What is important is to keep the three sciences in balance: physical science, biological science, and social science. When they get out of balance the areas of concern of the other two suffer. The consequences in some cases can be catastrophic. The greatest impact that the Internet continues to have is that the three sciences and their accompanying disciplines have not learned how to manage and control the communications infrastructure that is the Internet.”

Anonymously, a communications professor who researches new-media effects responded, “While there are many concerns, the greatest may be the most easily overlooked. This is the change in how ordinary citizens gather information (i.e., receive news) about any issue/topic. As ‘news’ and information are increasingly gathered from a variety of outlets (i.e., traditional, new, interpersonal, networked, and not), and outlets are increasingly polarized, it is obvious that the Internet is not the ‘great equalizer’ that we once thought it was. There is a dark side, which is seen as people increasingly link to like-minded others/information and disassociate with dissimilar others/information. The need to foster media literacy education will increase (and we should be greatly concerned if nothing is done about it).”

Anonymously, an Internet marketer wrote, “Organizational dynamics will be tested since we have never had this many people on the planet before, nor have we had them all communicating together at the same time... The divided class system will provide resentment that will test the super-automated and connected systems. Robots will complicate the matter. The Internet will

contribute to an especially tumultuous economy and future for the world because it is scaling, growing, and being used beyond anyone's initial design or intent. Nobody really knows what will happen."

Larry Gell, director-general of the International Agency for Economic Development, responded, "Maybe the United Nations can finally do some meaningful work in countries instead of spending vast amounts on staff and repetitive annual meetings 'talking' about the global problems over and over again. The sharing of collaborative brain power worldwide could solve some of our unsolved problems."

14) Most people are not yet noticing the profound changes today's communications networks are already bringing about; these networks will be even more disruptive in the future.

Some experts say most people remain unaware of the major metamorphosis life online has already made on those who are connected. It is changing what it is to be human, some say, a paradigm shift that is positive, seductive, and dangerous, and some even say it may be "turning us into machines."

Elizabeth Albrycht, a senior lecturer in marketing and communications at the Paris School of Business, wrote, "By 2025... our lives will be lived in a combination of virtual and physical spaces, and it will feel completely normal for most of us... The Internet is us and we are it. The Internet becomes the extension of the human mind and body. It is multiple, as are we. There will not be any big 'event' of adoption — we'll just naturally move there. Many of us are already close. The benefits are too big, too obvious to think otherwise. These include the ability to stay alive longer as healthy people. Who would say no to that?"

Nishant Shah, visiting professor at the Centre for Digital Cultures at Leuphana University, Germany, wrote, "It is going to systemically change our understandings of being human, being social, and being political. It is not merely a tool of enforcing existing systems; it is a structural change in the systems that we are used to. And this means that we are truly going through a paradigm shift — which is celebratory for what it brings, but it also produces great precariousness because existing structures lose meaning and valence, and hence, a new world order needs to be produced in order to accommodate for these new modes of being and operation. The greatest impact of the Internet is what we are already witnessing, but it is going to accelerate. It is going to fundamentally change the way in which we think of being human and the ways in which we dislocate our sense of self from the body. The distancing between the two is going to define the new realms of emotionality, sociality, governance, and production in new and unprecedented ways."

A certain level of dehumanization was predicted by some survey respondents, as they say that it removes the need for human-to-human contact and that its influence is to allow people to transform themselves into dumb machines.

Anonymously, a college professor at Grand Valley State University wrote, “Significant impacts by 2025 include: further distance between the super-wealthy and the impoverished, a further digital divide, increased emotional illness among the ‘wired,’ the undermining of sensitive childrearing, increased image-consciousness egoism and social envy, the further distancing of people from the air/water/earth that they need in order to function, and loss of sensuality and aesthetics associated with skill. The Internet is turning people into machines.”

Anonymously, a health sciences librarian from California wrote, “The government and corporations will see everything through not only cameras and satellites, but also through the very technology we carry around with us. As computers get smarter, they will be able to predict. The Internet will be a connector. Whether it connects thieves with money, sick people with the care they need, or fat couch-dwellers with delivered processed food, it will remove the need for people to interact with other people. The connections will all be online, over the Internet. Human connection will be very limited. The Internet will become, in a sense, our hivemind. With it sending all that information to corporations and possibly the government, the Internet will allow people to become ever less caring and ever less human. There will also be a backlash, and I imagine a fair number of people will go Luddite and possibly try to overthrow things. They will fail.”

Anonymously, a doctoral student in information science at the Universidade Estadual Paulista wrote, “There will be growing stress due to the shift in routines that e-job and 24/7 demands apply to human life. There will be increased dependency on e-infrastructure, there will be isolation, and more mediated relations, and family structure will be broken. With everyone looking for the next gadget to consume, humanity will be in a state of global dumbness.”

Anonymously, a futurist and consultant wrote, “My fear is that people will become so reliant on the data on the Internet that they will be unable to judge the difference between good data or false, limited, possibly-slanted information. People may be surrendering their ability to think and judge.”

Anonymously, a scholar of online communications responded, “We will be always connected, no matter where we are or what we're doing: always reachable, never unavailable. What will happen to alone time? Solitude? Thought? This is what I worry about.”

The Final Thesis: Today's Choices Matter

15) Foresight and accurate predictions can make a difference; 'The best way to predict the future is to invent it.'

A number of the experts who participated in the survey said it is important to contemplate future possibilities and work today to aim for a better tomorrow. The statements made in favor of foresight by four of them are included below as a fitting conclusion to this collection of expert predictions about the likely future of the Internet.

Anonymously, a professor at a Big 10 research university in the US wrote, "The democratization of information, user-generated content, sharing of research especially in science and medicine, the rapid communication during times of crisis and social change: these are the ways in which the Internet will continue to play a positive role between now and 2025. We just have to be sure we have backup plans because we are all a little too trusting that the network, power, and so forth will always work. And we also have to find ways to get exercise, communicate face-to-face, and use the Internet as a tool for change, not just a place to watch cat videos."

David Orban, CEO of Dotsub, wrote, "The most significant impacts by 2025 will be: extending human communication, building bridges of understanding that go across the language and cultural barriers of today; setting standards of excellence and opportunity for achievement that are globally visible and available as rich and varied role models for self-guided individuals and organizations; lowering the barriers to access of knowledge and tools, making actionable information available for local adaptation and experimentation; eliminating obsolete rules and regulations that shackle individuals and societies."

Robert Cannon, Internet law and policy expert, wrote, "The greatest challenges, I think, will be labor and employment. The Internet, automation, and robotics will disrupt the economy as we know it. How will we provide for the humans who can no longer earn money through labor? The opportunities are simply tremendous. Information, the ability to understand that information, and the ability to act on that information will be available ubiquitously. Washer broken? Here are instructions on how to fix it and the diagrams for your 3D printer (and instructions for your house robot on how to do the work). Want to take care of normal household legal matters, wills, real estate, and so on? Automated. Want to travel? Advances in technology will make travel extremely affordable with new materials and fuels. Want to learn to dance? Here's how to do it: a hologram will show you in 3D, and you can be connected to your local community that has the same interests. Or we could become a brave new world were the government (or corporate power) knows everything about everyone everywhere and every move can be foreseen, and society is taken over by the elite with control of the technology. The world that our children will grow up in and

have families in will be entirely different than ours. We are teaching them how to grow up in our world and not preparing them for the future they are about to meet. Most of what we perceive will be disrupted — and we old folk will be obsolete. The good news is that the technology that promises to turn our world on its head is also the technology with which we can build our new world. It offers an unbridled ability to collaborate, share, and interact. ‘The best way to predict the future is to invent it.’ It is a very good time to start inventing the future.”

Sonigitu Asibong Ekpe, a consultant with the AgeCare Foundation, a non-profit organization, wrote, “The most significant impact of the Internet is getting us to imagine different paths that the future may take. These paths help us to be better prepared for long-term contingencies; by identifying key indicators, and amplifying signals of change, they help us ensure that our decisions along the way are flexible enough to accommodate change. Just as the architects of the ARPANET never anticipated the Internet of today, it is equally hard for us to predict the Internet’s evolution — its future and its impact. That billions more people are poised to come online in the emerging economies seems certain. Yet much remains uncertain: from who will have access, how, when, and at what price to the Internet’s role as an engine for innovation and the creation of commercial, social, and human value. As users, industry players, and policymakers, the interplay of decisions that we make today and in the near future will determine the evolution of the Internet and the shape it takes by 2025, in both intended and unintended ways. Regardless of how the future unfolds, the Internet will evolve in ways we can only begin to imagine. By allowing ourselves to explore and rehearse divergent and plausible futures for the Internet, not only do we and ourselves more prepared for any future, we can also help shape it for the better.”

John E. Savage, a research scientist at Brown University, argued that the best way to make better predictions would be deeper study of the Internet. He wrote, “The Internet needs to be studied as a medium. It deserves the kind of treatment that Marshall McLuhan gave to modern communications during its infancy. Nations around the world need to understand its potential and pitfalls so that we can collectively improve our cultures and economies will avoiding unnecessary disagreements and conflicts. For example, we are all very much aware that modernization is creating great stresses in nations that have lived by a religious code that is at odds with the prevailing cultures in other nations. These stresses need to be understood and, if possible, mediated so that nations can learn to respect differences in their cultures while not insisting that all adhere to one culture.”

Many of the experts who participated in answering this survey question said their expectation is an extension and continuation of what’s happening today. They say they expect it will be a potentially uneven but fairly predictable evolution of the forms of human connection we already see in the current network of networks.

Jari Arkko, Internet expert for Ericsson and chair of the Internet Engineering Task Force, wrote, “The loss of distance and place continues to accelerate, as Internet integrates even more deeply into our lives, from everyday objects to everywhere, all-the-time, real-time communication and media. The world becomes smaller, and physical borders have less significance. Those with ideas and platforms to connect people will continue to grow in importance (in good and bad).”

Bambi Francisco, CEO and entrepreneur with Vator, responded, “The Internet has essentially allowed information to be distributed without restriction. The impact has been a greater level of social equity and the empowerment of individuals, including those marginalized and in the minority. If we look toward the next 10 years, we will likely see the same, but more pronounced in different parts of the world.”

Jon Lebkowsky, advocacy web developer at Consumers Union, argued, “The Internet’s already woven into the fabric of everyday reality for individuals and companies worldwide, and there’s a powerful, world-changing channeling of information that has many upsides. The downside is that all data leaves a trail and all users can be tracked; we’re building surveillance into the infrastructure, and surveillance is subject to abuse.”

Anonymously, the CEO of a technology company wrote, “The most significant overall impacts will be in national security challenges, cyber attacks, and theft. On the other hand, more people will have the opportunity to connect, share, collaborate, and create economic growth. The greatest impact will be in teleworking, increased productivity, education and information access, transportation, healthcare, and housing advancements.”

Caroline Haythornthwaite, director and professor at The iSchool at The University of British Columbia, wrote, “The most significant impact will be on the ability to maintain work, socialize, family connections across distances. Open access will also be an impact, with continued reshuffling of publication and dissemination practices (scholarly communication, music, film, news.) There will also be a re-juggling of economic infrastructure — i.e., news business as a key example, but higher education coming right behind. Big data — its generation, management, use, and consequences — will also be a point of contention. Participatory culture will also hold influence.”

Alison Alexander, a professor at the Grady College of Journalism and Mass Communication at the University of Georgia, wrote, “There will be increased and ever-changing threats to privacy and security; increased ability to isolate self from personal interaction; threats to employment; shifts in power structures with unforeseeable consequences. Globally, there will be better access to information and entertainment, as well as the killer apps that will emerge; merged devices; an emerging global economy with potential smoothing of differences in affluence; improved

governmental and corporate efficiency; and advances in research due to collaboration and sharing of information.”

Anonymously, the owner of a start-up related to mobile technology wrote, “In countries with a diverse civil society and strong legal tradition, the Internet will, on balance, remain a positive. In countries without those traditions, it will continue to be a lever of control.”

A number of respondents said by 2025 the Internet will be more of the same but it will extend to reach more people. **Anonymously**, an associate professor of communications wrote, “It will bring: more Arab Springs, more cyber attacks, more privacy issues, more creativity and collaboration, more copyright infringements, more cyber warfare, and online education.”

Anonymously, a science and technology policy analyst wrote, “Between now and 2025, the biggest change will be the greater engagement of more people in the developing world. That diminution of the global digital divide will translate into a wide range of social, economic, creative, and political phenomena. Processes we have begun to see (positive and negative) will continue to play out.”

And the final word comes from gaming researcher and teacher **Marc Prensky**: “The biggest impact will come from something we don't currently foresee. Stay alert!”